

科目コード /Code	科目名(和文) / Course Title	
工学研究科共通型授業科目 / Common Subjects of Graduate School of Engineering		
i010	工学研究科国際インターンシップ 1	International Internship in Engineering 1
i011	工学研究科国際インターンシップ 2	International Internship in Engineering 2
i041	科学技術者のためのプレゼンテーション演習	Professional Scientific Presentation Exercises
i042	工学と経済（上級）	Advanced Engineering and Economy
i045	実践的科学英語演習Ⅰ	Exercise in Practical Scientific English I
i046	実践的科学英語演習Ⅱ	Exercise in Practical Scientific English II
i049	エンジニアリングプロジェクトマネジメント	Project Management in Engineering
i051	現代科学技術の巨人セミナー「知のひらめき」（6Hコース）	Frontiers in Modern Scinece and Technology (6H course)
i052	現代科学技術の巨人セミナー「知のひらめき」（12Hコース）	Frontiers in Modern Scinece and Technology (12H course)
i055	現代科学技術特論（4回コース）	Advanced Modern Science and Technology (4 times course)
i056	現代科学技術特論（8回コース）	Advanced Modern Science and Technology (8 times course)
i057	安全衛生工学（4回コース）	Safety and Health Engineering (4 times course)
i058	安全衛生工学（11回コース）	Safety and Health Engineering (11 times course)
i059	エンジニアリングプロジェクトマネジメント演習	Exercise on Project Management in Engineering
i060	現代科学技術特論（12回コース）	Advanced Modern Science and Technology (12 times course)
i061	先端マテリアルサイエンス通論（4回コース）	Introduction to Advanced Material Science and Technology (4 times course)
i062	先端マテリアルサイエンス通論（8回コース）	Introduction to Advanced Material Science and Technology (8 times course)
i063	先端マテリアルサイエンス通論（12回コース）	Introduction to Advanced Material Science and Technology (12 times course)
社会基盤工学専攻 / Civil and Earth Resources Engineering		
都市社会工学専攻 / Urban Management		
都市環境工学専攻 / Enviromental Engineering		
A019	コンクリート構造工学	Concrete Structural Engineering
A040	流砂水理学	Sediment Hydraulics
A055	環境地盤工学	Environmental Geotechnics
A216	水文学	Hydrology
A402	資源開発システム工学	Resources Development Systems
A405	地殻環境工学	Environmental Geosphere Engineering
A420	探査工学特論	Exploration Geophysics, Adv.
A805	リモートセンシングと地理情報システム	Remote Sensing and Geographic Information Systems
A808	景観デザイン論	Civic and Landscape Design
F003	連続体力学	Continuum Mechanics
F009	構造デザイン	Structural Design
F010	橋梁工学	Bridge Engineering
F011	数値流体力学	Computational Fluid Dynamics
F019	河川マネジメント工学	River Management
F025	地盤力学	Geomechanics
F053	応用数理解析	Applied Mathematics in Civil & Earth Resources Engineering
F065	水域社会基盤学	Hydraulic Engineering for Infrastructure Development and Management
F067	構造安定論	Structural Stability
F068	材料・構造マネジメント論	Material and Structural System & Management
F071	応用弾性学	Applied Elasticity for Rock Mechanics
F073	物理探査の基礎数理	Fundamental Theories in Geophysical Exploration
F075	水理乱流力学	Hydrodynamics and Turbulence Mechanics
F078	岩盤応力と地殻物性	Rock stress and physical properties
F085	地殻環境計測	Measurement in the earth's crust environment
F089	社会基盤安全工学	Infrastructure Safety Engineering
F100	応用水文学	Applied Hydrology
F103	環境防災生存科学	Case Studies Harmonizing Disaster Management and Environment Conservation
F106	流域管理工学	Integrated Disasters and Resources Management in Watersheds
F109	地盤防災工学	Disaster Prevention through Geotechnics
F113	グローバル生存学	Global Survivability Studies
F201	都市社会情報論	Information Technology for Urban Society
F203	公共財政論	Public Finance
F207	都市社会環境論	Urban Environmental Policy
F215	交通情報工学	Intelligent Transportation Systems
F219	人間行動学	Quantitative Methods for Behavioral Analysis
F223	リスクマネジメント論	Risk Management
F227	構造ダイナミクス	Structural Dynamics
F241	ジオコンストラクション	Construction of Geotechnical Infrastructures
F245	開水路の水理学	Open Channel Hydraulics
F251	自主企画プロジェクト	Exercise on Project Planning
F261	地震・ライフライン工学	Earthquake Engineering/Lifeline Engineering
F263	サイスミックシミュレーション	Seismic Engineering Exercise
F269	沿岸・都市防災工学	Coastal and Urban Water Disasters Engineering
F380	強靱な国づくりのためのエンジニアリングセミナー	Engineering Seminar for Disaster Resilience in ASEAN countrie
F405	ジオフロント工学原論	Fundamental Geofront Engineering
F415	環境材料設計学	Ecomaterial Design
F464	水工計画学	Hydrologic Design and Management
F466	流域環境防災学	Disaster Mitigation for Sustainable Basin Environment
K016	計算地盤工学	Computational Geotechnics
W001	社会基盤構造工学	Structural Engineering for Civil Infrastructure
X311	都市基盤マネジメント論	Urban Infrastructure Management
X333	災害リスク管理論	Disaster Risk Management
社会基盤工学専攻 / Civil and Earth Resources Engineering		
F063	社会基盤工学実習	Practice in Infrastructure Engineering
U051	社会基盤工学総合セミナー A	Integrated Seminar on Infrastructure Engineering A
U052	社会基盤工学総合セミナー B	Integrated Seminar on Infrastructure Engineering B
U055	社会基盤工学セミナー A	Seminar on Infrastructure Engineering A
U056	社会基盤工学セミナー B	Seminar on Infrastructure Engineering B
U059	社会基盤工学インターンシップ	Internship on Infrastructure Engineering
U060	社会基盤工学 O R T	ORT on Infrastructure Engineering

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U064	社会基盤工学総合実習A	Practice in Advanced Infrastructure Engineering A
U065	社会基盤工学総合実習B	Practice in Advanced Infrastructure Engineering B
都市社会工学専攻 / Urban Management		
F150	長期インターンシップ	Long-Term Internship
F253	キャップストーンプロジェクト	Capstone Project
F257	都市社会工学セミナーA	Seminar on Urban Management A
F259	都市社会工学セミナーB	Seminar on Urban Management B
U201	都市社会工学総合セミナーA	Integrated Seminar on Urban Management A
U203	都市社会工学総合セミナーB	Integrated Seminar on Urban Management B
U210	都市社会工学実習	Practice in Urban Management
U216	都市社会工学ORT	ORT on Urban Management
U224	都市社会工学総合実習A	Practice in Advanced Urban Management A
U225	都市社会工学総合実習B	Practice in Advanced Urban Management B
都市環境工学専攻 / Enviromental Engineering		
A622	地圏環境工学特論	Geohydro Environment Engineering, Adv.
A626	環境衛生学特論	Environmental Health, Adv.
A632	都市代謝工学	Urban Metabolism Engineering
A643	環境微生物学特論	Environmental Microbiology, Adv.
F234	水質衛生工学	Water Sanitary Engineering
F400	都市環境工学セミナーA	Seminar on Urban and Environmental Engineering A
F402	都市環境工学セミナーB	Seminar on Urban and Environmental Engineering B
F439	環境リスク学	Environmental Risk
F441	水環境工学	Water Quality Control Engineering
F446	大気・地球環境工学特論	Atmospheric and Global Environmental Engineering, Adv.
F449	都市環境工学演習A	Laboratory and Seminar on Urban and Environmental Engineering A
F450	都市環境工学演習B	Laboratory and Seminar on Urban and Environmental Engineering B
F454	循環型社会システム論	Systems Approach on Sound Material Cycles Society
F456	新環境工学特論I	New Environmental Engineering I, Adv.
F458	新環境工学特論II	New Environmental Engineering II, Adv.
F461	原子力環境工学	Nuclear Environmental Engineering, Adv.
F468	環境微量分析演習	Environmental Organic Micropollutants Analysis Lab.
F470	環境工学先端実験演習	Advanced Enivronmental Engineering Lab.
F472	環境工学実践セミナー	Seminer on Practical Issues in Urban and Environmental Engineering
F475	都市環境工学ORT	ORT on Urban and Environmental Engineering
U401	都市環境工学特別セミナーA	Seminar on Urban and Environmental Engineering A, Adv.
U403	都市環境工学特別セミナーB	Seminar on Urban and Environmental Engineering B, Adv.
X321	環境リスク管理リーダー論	Lecture on Environmental Risk Management Leader
建築学専攻 / Architecture and Architectural Engineering		
A856	居住空間計画学	Dwelling Planning
B013	建築設計特論	Theory of Architectural Design, Adv.
B014	建築環境計画論 I	Theory of Architectural and Environmental Planning I
B016	建築論特論	Theory of Architecture, Adv.
B017	建築都市文化史学特論	History of Architecture and Environmental Design
B019	建築プロジェクトマネジメント論	Project Management
B032	応用固体力学 I	Applied Solid Mechanics I
B033	応用固体力学 II	Applied Solid Mechanics II
B035	人間生活環境デザイン論	Design Theory of Architecture and Human Environment
B036	建築史学特論	History of Japanese Architecture
B037	建築設計力学	Design Mechanics for Building Structures
B038	人間生活環境認知論	Theory of Cognition in Architecture and Human Environment
B040	構造解析学特論	Analysis of Structures, Adv.
B043	コンクリート系構造特論	Concrete Structures, Adv.
B044	耐震構造特論	Earthquake Resistant Structures, Adv.
B046	建築振動論	Dynamic Response of Building Structures
B052	構造安全制御	Control for Structural Safety
B053	建築環境物理学特論	Physics in Architectural Environmental Engineering, Adv.
B054	建築設備システム特論	Building Systems
B062	建築学特別演習 I	Seminar on Architecture and Architectural Engineering, I
B063	建築学特別演習II	Seminar on Architecture and Architectural Engineering, II
B069	建築技術者倫理	Architectural Engineer Ethics
B071	インターンシップ I (建築)	Internship I, Architectural Design Practice
B073	インターンシップ II (建築)	Internship II, Architectural Design Practice
B075	建築設計実習	Architectural Design Practice
B077	建築設計演習 I	Architecture Design Studio I
B079	建築設計演習 II	Architecture Design Studio II
B080	建築工事監理実習	Construction Supervision Practice
B088	建築学総合演習	Exercises in Architecture and Architectural Engineering
B100	静粛環境工学	Silence amenity engineering
B222	環境制御工学特論	Environmental Control Engineering, Adv.
B226	建築地盤工学	Building Geoenvironment Engineering
B231	高性能構造工学	High Performance Structural Systems Engineering
B234	鋼構造特論	Steel Structures, Adv.
B238	建築風工学	Architectural Wind Engineering
B241	都市災害管理学	Urban Disaster Management
B259	音響空間設計論	Theory of Acoustic Space Design in Architecture
i017	建築学コミュニケーション (専門英語)	Architecture Communication
Q005	建築設計・計画学セミナー I	Seminar on Architectural Design and Planning I
Q006	建築設計・計画学セミナーII	Seminar on Architectural Design and Planning II
Q008	建築構造学セミナー I	Seminar on Structural Engineering of Buildings I
Q009	建築構造学セミナーII	Seminar on Structural Engineering of Buildings II
Q011	建築環境工学セミナー I	Seminar on Environmental Engineering I
Q012	建築環境工学セミナーII	Seminar on Environmental Engineering II
Q013	建築環境工学セミナーIII	Seminar on Environmental Engineering III
Q014	建築環境工学セミナーIV	Seminar on Environmental Engineering IV

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Q015	建築構造学セミナーⅢ	Seminar on Structural Engineering of Buildings III
Q016	建築構造学セミナーⅣ	Seminar on Structural Engineering of Buildings IV
Q017	建築設計・計画学セミナーⅢ	Seminar on Architectural Design and Planning III
Q018	建築設計・計画学セミナーⅣ	Seminar on Architectural Design and Planning IV
Q021	先端建築学特論Ⅰ	Advanced Theory of Architecture and Architectural Engineering I
Q022	先端建築学特論Ⅱ	Advanced Theory of Architecture and Architectural Engineering II
X401	デザイン方法論	Design Methodology
X413	建築構造デザイン論	Design Theory of Architectural Structure
機械理工学専攻 / Mechanical Engineering and Science		
マイクロエンジニアリング専攻 / Micro Engineering		
航空宇宙工学専攻 / Aeronautics and Astronautics		
B418	先進材料強度論	Strength of Advanced Materials
G001	応用数値計算法	Applied Numerical Methods
G003	固体力学特論	Solid Mechanics, Adv.
G005	熱物理学	Thermal Science and Engineering
G007	基盤流体力学	Introduction to Advanced Fluid Dynamics
G009	量子物性物理学	Quantum Condensed Matter Physics
G011	設計生産論	Design and Manufacturing Engineering
G013	動的システム制御論	Dynamic Systems Control Theory
G041	有限要素法特論	Advanced Finite Element Method
G049	インターンシップM（機械工学群）	Engineering Internship M
G056	English Technical Writing	English Technical Writing
G057	技術者倫理と技術経営	Engineering Ethics and Management of Technology
G058	複雑系機械工学基礎セミナー 1	Basic Seminar of Complex Mechanical Engineering,1
G059	複雑系機械工学基礎セミナー 2	Basic Seminar of Complex Mechanical Engineering,2
G061	応用数理科学	Applied mathematical sciences
K013	先端機械システム学通論	Advanced Mechanical Engineering
V003	バイオメカニクス	Biomechanics
V019	インターンシップDS（機械工学群）	Engineering Internship DS
V020	インターンシップDL（機械工学群）	Engineering Internship DL
V025	複雑系機械工学セミナーA	Seminar of Complex Mechanical Engineering for the 21st Century COE Program,A
V027	複雑系機械工学セミナーB	Seminar of Complex Mechanical Engineering for the 21st Century COE Program,B
V029	複雑系機械工学セミナーC	Seminar of Complex Mechanical Engineering for the 21st Century COE Program,C
V031	複雑系機械工学セミナーD	Seminar of Complex Mechanical Engineering for the 21st Century COE Program,D
V033	複雑系機械工学セミナーE	Seminar of Complex Mechanical Engineering for the 21st Century COE Program,E
V035	複雑系機械工学セミナーF	Seminar of Complex Mechanical Engineering for the 21st Century COE Program,F
X402	アーティファクトデザイン論	Theory for Designing Artifacts
X411	複雑系機械システムのデザイン	Design of Complex Mechanical Systems
機械理工学専攻 / Mechanical Engineering and Science		
B407	ロボティクス	Robotics
B622	熱物性論	Thermophysics for Thermal Engineering
B629	量子ビーム物質解析学	Analysis of Materials by Quantum Beams
B631	高エネルギー材料工学	High Energy Radiation Effects in Solid
G017	破壊力学	Fracture Mechanics
G021	光物理学	Engineering Optics and Spectroscopy
G025	メカ機能デバイス工学	Mechanical Functional Device Engineering
G031	機械理工学セミナーA	Seminar on Mechanical Engineering and Science A
G032	機械理工学セミナーB	Seminar on Mechanical Engineering and Science B
G036	機械理工学基礎セミナーA	Basic Seminar on Mechanical Engineering and Science A
G037	機械理工学基礎セミナーB	Basic Seminar on Mechanical Engineering and Science B
G039	熱物質移動論	Transport Phenomena
G051	機械理工学特別実験及び演習第一	Experiments on Mechanical Engineering and Science,Adv. I
G053	機械理工学特別実験及び演習第二	Experiments on Mechanical Engineering and Science,Adv. II
G403	最適システム設計論	Optimum System Design Engineering
Q610	原子系の動力学セミナー	Seminar: Dynamics of Atomic Systems
Q807	デザインシステム学	Theory for Design Systems Engineering
V012	機械理工学特別演習A	Advanced Exercise in Mechanical Engineering and ScienceA
V013	機械理工学特別演習B	Advanced Exercise in Mechanical Engineering and ScienceB
V014	機械理工学特別演習C	Advanced Exercise in Mechanical Engineering and ScienceC
V015	機械理工学特別演習D	Advanced Exercise in Mechanical Engineering and ScienceD
V016	機械理工学特別演習E	Advanced Exercise in Mechanical Engineering and ScienceE
V017	機械理工学特別演習F	Advanced Exercise in Mechanical Engineering and ScienceF
マイクロエンジニアリング専攻 / Micro Engineering		
B617	量子分子物理学特論	Quantum Theory of Molecular Physics
G204	マイクロファブリケーション	Microfabrication
G206	マイクロ・バイオシステム	Micro/bio system
G211	物性物理学 1	Solid State Physics 1
G214	精密計測加工学	Precision Measurement and Machining
G216	マイクロエンジニアリング セミナーA	Seminar on Micro Engineering A
G217	マイクロエンジニアリング セミナーB	Seminar on Micro Engineering B
G223	マイクロエンジニアリング 基礎セミナーA	Basic Seminar on Micro Engineering A
G224	マイクロエンジニアリング 基礎セミナーB	Basic Seminar on Micro Engineering B
G226	マイクロエンジニアリング 特別実験及び演習第一	Experiments on Micro Engineering, Adv. I
G228	マイクロエンジニアリング 特別実験及び演習第二	Experiments on Micro Engineering, Adv. II
V201	微小電気機械システム創製学	Micro Electro Mechanical System Creation
V205	物性物理学 2	Solid State Physics 2
V210	マイクロエンジニアリング 特別演習A	Advanced Exercise in Micro Engineering A
V211	マイクロエンジニアリング 特別演習B	Advanced Exercise in Micro Engineering B
V212	マイクロエンジニアリング 特別演習C	Advanced Exercise in Micro Engineering C
V213	マイクロエンジニアリング 特別演習D	Advanced Exercise in Micro Engineering D
V214	マイクロエンジニアリング 特別演習E	Advanced Exercise in Micro Engineering E
V215	マイクロエンジニアリング 特別演習F	Advanced Exercise in Micro Engineering F

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航空宇宙工学専攻 / Aeronautics and Astronautics		
C430	航空宇宙機力学特論	Advanced Flight Dynamics of Aerospace Vehicle
G230	動的固体力学	Dynamics of Solids and Structures
G405	推進工学特論	Propulsion Engineering, Adv.
G406	気体力学特論	Gas Dynamics, Adv.
G409	航空宇宙システム制御工学	Aerospace Systems and Control
G411	航空宇宙流体力学	Fluid Dynamics for Aeronautics and Astronautics
G418	航空宇宙工学特別実験及び演習第一	Experiments and Exercises in Aeronautics and Astronautics I
G420	航空宇宙工学特別実験及び演習第二	Experiments and Exercises in Aeronautics and Astronautics II
M226	気象学Ⅰ	Meteorology I
M227	気象学Ⅱ	Meteorology II
R410	航空宇宙機システムセミナー	Seminar on Aerospace systems
R419	システム制御工学セミナー	Seminar on Systems and Control
V401	電離気体工学セミナー	Seminar on Engineering Science of Ionized Gases
V405	航空宇宙流体力学セミナー	Seminar on Fluid Dynamics for Aeronautics and Astronutics
V407	最適システム設計工学セミナー	Seminar on Optimum System Design Engineering
V412	気体力学セミナー	Seminar on Gas Dynamics
V413	機能構造力学セミナー	Seminar on Mechanics of Functional Solids and Structures
原子核工学専攻 / Nuclear Engineering		
C004	場の量子論	Quantum Field Theory
C013	核材料工学	Nuclear Materials
C014	核燃料サイクル工学 1	Nuclear Fuel Cycle 1
C015	核燃料サイクル工学2	Nuclear Fuel Cycle 2
C017	放射線物理工学	Radiation Physics and Engineering
C031	量子制御工学	Quantum Manipulation Technology
C034	核エネルギー変換工学	Nuclear Energy Conversion and Reactor Engineering
C037	混相流工学	Multiphase Flow Engineering and Its Application
C038	核融合プラズマ工学	Physics of Fusion Plasmas
C047	放射線医学物理学	Medical Physics
C050	インターンシップM（原子核）	Engineering Internship M
C063	原子核工学特別実験及演習第一	Experiments and Exercises on Nuclear Engineering, Adv.I
C064	原子核工学特別実験及演習第二	Experiments and Exercises on Nuclear Engineering, Adv.II
C068	原子力工学応用実験	Nuclear Engineering Application Experiments
C070	基礎量子科学	Introduction to Quantum Science
C072	基礎量子エネルギー工学	Introduction to Advanced Nuclear Engineering
C074	量子科学	Quantum Science
C076	基礎電磁流体力学	Fundamentals of Magnetohydrodynamics
C078	複合加速器工学	Advanced Accelerator Technology
C080	原子炉安全工学	Nuclear Reactor Safety Engineering
C082	応用中性子工学	Applied Neutron Engineering
C084	原子核工学最前線	Nuclear Engineering, Adv.
C086	原子核工学序論 1	Introduction to Nuclear Engineering 1
C087	原子核工学序論 2	Introduction to Nuclear Engineering 2
C089	原子核工学セミナーA	Seminar on Nuclear Engineering A, B
C090	原子核工学セミナーB	Seminar on Nuclear Engineering A, B
R001	量子ビーム科学特論	Quantum Beam Science, Adv.
R004	量子物理学特論	Quantum Physics, Adv.
R013	非線形プラズマ工学	Nonlinear Physics of Fusion Plasma
R017	インターンシップD（原子核）	Engineering Internship D
R019	原子核工学特別セミナーA	Seminar on Nuclear Engineering, Adv. A
R021	原子核工学特別セミナーB	Seminar on Nuclear Engineering, Adv. B
R023	原子核工学特別セミナーC	Seminar on Nuclear Engineering, Adv. C
R025	原子核工学特別セミナーD	Seminar on Nuclear Engineering, Adv. D
R027	原子核工学特別セミナーE	Seminar on Nuclear Engineering, Adv. E
R029	原子核工学特別セミナーF	Seminar on Nuclear Engineering, Adv. F
W620	医学放射線計測学	Radiation Measurement for Medicine
材料工学専攻 / Materials Science and Engineering		
C209	非鉄製錬学特論	Non-ferrous extractive metallurgy, Adv.
C212	物質情報工学	Materials Informatics
C214	凝固・結晶成長学	Microstructure,solidification and crystal growth
C240	材料工学特別実験及演習第一	Laboratory & Seminar in Materials Science and Engineering, Adv. I
C241	材料工学特別実験及演習第二	Laboratory & Seminar in Materials Science and Engineering, Adv. II
C251	材料工学セミナーA	Seminar on Materials Science and Engineering A
C253	材料工学セミナーB	Seminar on Materials Science and Engineering B
C263	結晶物性学特論	Physical Properies of Crystals Adv.
C267	セラミックス材料学	Ceramic Materials Science
C271	磁性物理	Magnetism and Magnetic Materials
C273	社会基盤材料特論Ⅰ	Advanced Materials Science & Engineering in industries I
C275	社会基盤材料特論Ⅱ	Advanced Materials Science & Engineering in industries II
C277	インターンシップM（材料工学）	Internship in Materials Science & Engineering
C286	原子分子工学特論	Atomic-molecular scale engineering
C288	材料組織・構造評価学	Microstructure theory and structure evaluation
C289	先進構造材料特論	Advanced Structural Metallic Materials
C290	材料電気化学特論	Electrochemistry for Materials Processing, Adv.
R241	材料工学特別セミナーA	Seminar on Materials Science and Engineering, Adv.A
R242	材料工学特別セミナーB	Seminar on Materials Science and Engineering, Adv.B
R243	材料工学特別セミナーC	Seminar on Materials Science and Engineering, Adv.C
R244	材料工学特別セミナーD	Seminar on Materials Science and Engineering, Adv.D
R245	材料工学特別セミナーE	Seminar on Materials Science and Engineering, Adv. E
R247	材料工学特別セミナーF	Seminar on Materials Science and Engineering, Adv.F
電気工学専攻 / Electrical Engineering		
C604	応用システム理論	Applied Systems Theory
C610	電磁気学特論	Electromagnetic Theory, Adv.

科目コード /Code	科目名(和文) ／ Course Title	
C611	電磁界シミュレーション	Computer Simulation of Electrodynamics
C612	宇宙電波工学	Space Radio Engineering
C613	超伝導工学	Superconductivity Engineering
C617	マイクロ波応用工学	Applied Microwave Engineering
C625	電気回路特論	Theory of Electric Circuits, Adv.
C627	研究インターンシップM（電気）	Research Internship(M)
C628	状態方程式論	State Space Theory of Dynamical Systems
C631	制御系設計理論	Design of Control Systems
C643	電気工学特別実験及演習 1	Advanced Experiments and Exercises in Electrical Engineering I
C646	電気工学特別実験及演習 2	Advanced Experiments and Exercises in Electrical Engineering II
C647	電気電磁回路論	Electrical and Electromagnetic Circuits
C718	電気工学特別研修 1（インターン）	Advanced Seminar in Electrical EngineeringI
C720	電気工学特別研修 2（インターン）	Advanced Seminar in Electrical EngineeringII
C800	半導体ナノスピントロニクス	Semiconductor Nanospintronics
K010	先端電気電子工学通論	Recent Advances in Electrical and Electronic Engineering
R610	電気工学特別セミナー	Advanced Electrical Engineering Seminar
R630	研究インターンシップD（電気）	Research Internship (D)
R632	電気工学特別演習1	Advanced Exercises on Electrical Engineering I
R633	電気工学特別演習2	Advanced Exercises on Electrical Engineering II
電子工学専攻 / Electronic Science and Engineering		
C710	電子工学特別実験及演習 1	Advanced Experiments and Exercises in Electronic Science and Engineering I
C713	電子工学特別実験及演習 2	Advanced Experiments and Exercises in Electronic Science and Engineering II
C801	電子装置特論	Charged Particle Beam Apparatus
C803	量子情報科学	Quantum Information Science
C810	半導体工学特論	Semiconductor Engineering, Adv.
C813	電子材料学特論	Electronic Materials, Adv.
C819	表面電子物性工学	Surface Electronic Properties
C821	研究インターンシップM（電子）	Research Internship(M)
C822	光物性工学	Optical Properties and Engineering
C825	量子論電子工学	Quantum Theory for Electronics
C828	光量子デバイス工学	Quantum Optoelectronics Devices
C830	量子計測工学	Quantum measurement
C846	電子工学特別研修 1（インターン）	Advanced Seminar in Electronic Science and Engineering I
C848	電子工学特別研修 2（インターン）	Advanced Seminar in Electronic Science and Engineering II
C851	電気伝導	Electrical Conduction in Condensed Matter
R701	電子工学特別セミナー	Advanced Seminar on Electronic Science and Engineering
R823	研究インターンシップD（電子）	Research Internship (D)
R825	電子工学特別演習1	Advanced Exercises on Electronic Science and Engineering I
R827	電子工学特別演習2	Advanced Exercises on Electronic Science and Engineering II
材料化学専攻 / Material Chemistry 物質エネルギー化学専攻 / Energy and Hydrocarbon Chemistry 分子工学専攻 / Molecular Engineering 高分子化学専攻 / Polymer Chemistry 合成・生物化学専攻 / Synthetic Chemistry and Biological Chemistry 化学工学専攻 / Chemical Engineering		
D043	先端科学機器分析及び実習 I	Instrumental Analysis,Adv.I
D046	先端科学機器分析及び実習Ⅱ	Instrumental Analysis,Adv.II
D837	Supramolecular Chemistry	Supramolecular Chemistry
H041	有機金属化学 1	Organotransition Metal Chemistry 1
H818	先端有機化学	Advanced Organic Chemistry
材料化学専攻 / Material Chemistry		
D037	材料化学特別実験及演習	Laboratory and Exercise in Material Chemistry
H001	無機材料化学	Chemistry of Inorganic Materials
H004	有機材料化学	Chemistry of Organic Materials
H007	高分子材料化学	Chemistry of Polymer Materials
H010	機能材料化学	Chemistry of Functional Materials
H015	応用固体化学	Industrial Solid-State Chemistry
H019	有機材料合成化学	Synthesis of Organic Materials
H025	材料解析化学	Analysis and Characterization of Materials
H029	高分子機能物性	Polymer Physics and Function
P055	材料化学特論第一	Material Chemistry Adv. I
P056	材料化学特論第二	Material Chemistry Adv. II
P110	材料化学総論	General Material Chemistry
P111	化学産業特論	Chemical Industry, Advanced
S001	機能材料設計学	Design of Functional Materials
S002	機能材料設計学特論	Design of Functional Materials, Advanced
S003	無機構造化学特論	Inorganic Structural Chemistry, Advanced
S006	応用固体化学特論	Industrial Solid-State Chemistry, Advanced
S010	有機反応化学特論	Organic Reaction Chemistry, Advanced
S013	天然物有機化学特論	Organic Chemistry of Natural Products, Advanced
S016	材料解析化学特論	Analytical Chemistry of Materials, Advanced
S019	高分子材料物性特論	Physical Properties of Polymer Materials, Advanced
S022	高分子材料合成特論	Synthesis of Polymer Materials, Advanced
物質エネルギー化学専攻 / Energy and Hydrocarbon Chemistry		
D230	物質エネルギー化学特論第三	Energy and Hydrocarbon Chemistry, Adv. III
D231	物質エネルギー化学特論第四	Energy and Hydrocarbon Chemistry, Adv. IV
D234	物質エネルギー化学特別実験及演習	Experiments & Exercises in Energy and Hydrocarbon Chemistry, Adv.
D235	物質エネルギー化学特論第七	Energy and Hydrocarbon Chemistry, Adv.VII
D236	物質エネルギー化学特論第八	Energy and Hydrocarbon Chemistry, Adv.VIII
H201	エネルギー変換反応論	Energy Conversion Reactions
H208	物質エネルギー化学特別セミナーA	Seminar on Energy & Hydrocarbon Chemistry (A)



科目コード /Code	科目名(和文) / Course Title	
H209	先端医工学	Advanced Biomedical Engineering
H210	有機錯体化学	Chemistry of Organometallic Complexes
H217	資源変換化学	Chemical Conversion of Carbon Resources
H219	構造有機化学	Structural Organic Chemistry
H222	物質変換化学	Chemical Transformations
H226	錯体触媒設計学	Chemistry of Well-Defined Catalysts
H232	物質エネルギー化学特論第五	Energy and Hydrocarbon Chemistry, Adv.V
H238	放射化学特論	Radiochemistry, Adv.
H240	有機典型元素化学	Organic Main-Group Element Chemistry
S204	物質エネルギー化学特別セミナー 1	Energy and Hydrocarbon Chemistry Special Seminar 1
S205	物質エネルギー化学特別セミナー 2	Energy and Hydrocarbon Chemistry Special Seminar 2
S206	物質エネルギー化学特別セミナー 3	Energy and Hydrocarbon Chemistry Special Seminar 3
分子工学専攻 / Molecular Engineering		
D432	分子工学特別実験及演習 I	Laboratory and Exercises in Molecular Engineering I
D433	分子工学特別実験及演習 II	Laboratory and Exercises in Molecular Engineering II
D440	分子工学特論第二A	Molecular Engineering, Adv. IIA
D447	分子工学特論第二B	Molecular Engineering, Adv. IIB
H401	統計熱力学	Statistical Thermodynamics
H406	量子化学 II	Quantum Chemistry II
H416	分子触媒学	Catalysis Science at Molecular Level
H417	分子光化学	Molecular Photochemistry
H423	物性物理化学	Condensed Matter Physical Chemistry
H436	分子工学特論第三	Molecular Engineering, Adv. III
P416	分子触媒学続論	Catalysis Science at Molecular Level 2
P417	分子光化学続論	Molecular Photochemistry 2
P439	分子工学特論第六	Molecular Engineering, Adv. VI
S401	分子工学特論	Advanced Molecular Engineering
S404	分子工学特別セミナー 1	Advanced Seminar on Molecular Engineering 1
S405	分子工学特別セミナー 2	Advanced Seminar on Molecular Engineering 2
高分子化学専攻 / Polymer Chemistry		
D640	高分子化学特別実験及演習	Polymer Chemistry Laboratory & Exercise
D652	高分子物性	Polymer Physical Properties
H607	高分子生成論	Design of Polymerization Reactions
H610	反応性高分子	Reactive Polymers
H611	生体機能高分子	Biomacromolecular Science
H613	高分子機能学	Polymer Structure and Function
H616	高分子集合体構造	Polymer Supramolecular Structure
H622	高分子基礎物理化学	Fundamental Physical Chemistry of Polymers
H628	高分子材料設計	Design of Polymer Materials
H636	医薬用高分子設計学	Polymer Design for Biomedical
H643	高分子溶液学	Polymer Solution Science
H645	高分子機能化学	Polymer Functional Chemistry
H647	高分子制御合成	Polymer Controlled Synthesis
H649	高分子合成	Polymer Synthesis
H650	高分子機能化学特論	Polymer Functional Chemistry, Adv.
H651	高分子生成論特論	Design of Polymerization Reactions, Adv.
H652	反応性高分子特論	Reactive Polymers, Adv.
H653	生体機能高分子特論	Biomacromolecular Science, Adv.
H654	高分子機能学特論	Polymer Structure and Function, Adv.
H655	高分子溶液学特論	Polymer Solution Science, Adv.
H656	高分子基礎物理化学特論	Physical Chemistry of Polymers, Adv.
H658	高分子集合体構造特論	Polymer Supramolecular Structure, Adv.
H659	高分子材料設計特論	Design of Polymer Materials, Adv.
H660	高分子制御合成特論	Polymer Controlled Synthesis, Adv.
H661	医薬用高分子設計学特論	Polymer Design for Biomedical and Pharmaceutical Applications, Adv.
H662	先端機能高分子	Developments in Polymer Assembly and Functionality
H663	生命医科学	Life and Medical Sciences
H664	先端機能高分子特論	Developments in Polymer Assembly and Functionality, Adv.
H665	生命医科学特論	Life and Medical Sciences, Adv.
P651	高分子科学セミナーI	Polymer Science Seminar I
P652	高分子科学セミナーII	Polymer Science Seminar II
S604	高分子化学特別セミナー 1	Advanced Seminar on Polymer Chemistry 1
S605	高分子化学特別セミナー 2	Advanced Seminar on Polymer Chemistry 2
合成・生物化学専攻 / Synthetic Chemistry and Biological Chemistry		
D828	合成・生物化学特別実験及演習	Special Experiments and Exercises Synthetic Chemistry and Biological Chemistry
D840	合成・生物化学特論B	Synthetic Chemistry and Biological Chemistry, Adv,B
D842	合成・生物化学特論D	Synthetic Chemistry and Biological Chemistry, Adv,D
D844	合成・生物化学特論F	Synthetic Chemistry and Biological Chemistry, Adv,F
H805	機能性錯体化学	Functional Coordination Chemistry
H806	有機機能化学	Organic Functional Chemistry
H812	分子生物化学	Molecular Biology
H813	生物有機化学	Bioorganic Chemistry
H834	精密合成化学	Fine Synthetic Chemistry
H836	先端生物化学	Advanced Biological Chemistry
P836	先端生物化学続論	Advanced Biological Chemistry 2 Continued
S807	合成・生物化学特別セミナー 1	Special Seminar 1 in Synthetic Chemistry and Biological Chemistry
S808	合成・生物化学特別セミナー 2	Special Seminar 2 in Synthetic Chemistry and Biological Chemistry
S809	合成・生物化学特別セミナー 3	Special Seminar 3 in Synthetic Chemistry and Biological Chemistry
化学工学専攻 / Chemical Engineering		
E033	化学工学特論第三	Special Topics in Chemical Engineering III
E038	プロセス設計	Process Design
E041	研究インターンシップ（化工）	Research Internship in Chemical Engineering
E045	化学工学特別実験及演習 I	Research in Chemical EngineeringI

科目コード /Code	科目名(和文) / Course Title	
E047	化学工学特別実験及演習Ⅱ	Research in Chemical EngineeringII
E049	化学工学特別実験及演習Ⅲ	Research in Chemical EngineeringIII
E051	化学工学特別実験及演習Ⅳ	Research in Chemical EngineeringIV
H003	Advanced Topics in Transport Phenomena	Advanced Topics in Transport Phenomena(English lecture)
H005	分離操作特論	Separation Process Engineering, Adv.
H008	反応工学特論	Chemical Reaction Engineering
H011	プロセスシステム論	Advanced Process Systems Engineering
H017	微粒子工学特論	Fine Particle Technology, Adv.
H020	界面制御工学	Surface Control Engineering
H021	化学材料プロセス工学	Engineering for Chemical Materials Processing
H023	環境システム工学	Environmental System Engineering
H035	化学工学特論第四	Special Topics in Chemical Engineering IV
P043	化学工学セミナー 1	Chemical Engineering Seminar I
P044	化学工学セミナー 2	Chemical Engineering Seminar II
P045	化学工学セミナー 3	Chemical Engineering Seminar III
P046	化学工学セミナー 4	Chemical Engineering Seminar IV
T004	化学工学特別セミナー 1	Special Seminar in Chemical Engineering 1
T006	化学工学特別セミナー 3	Special Seminar in Chemical Engineering 3
T007	化学工学特別セミナー 4	Special Seminar in Chemical Engineering 4
T008	化学工学特別セミナー 5	Special Seminar in Chemical Engineering 5
融合工学コース / Interdisciplinary Engineering Course Program - 応用力学分野 / Laboratory of Applied Mechanics		
G047	応用力学	Applied Dynamics
V037	応用力学特別実験及び演習第一	Advanced Experiment and Exercise in Applied Mechanics I
V039	応用力学特別実験及び演習第二	Advanced Experiment and Exercise in Applied Mechanics II
W005	応用力学特別演習 A	Advanced Exercise in Applied Mechanics A
W007	応用力学特別演習 B	Advanced Exercise in Applied Mechanics B
W009	応用力学特別演習 C	Advanced Exercise in Applied Mechanics C
W011	応用力学特別演習 D	Advanced Exercise in Applied Mechanics D
W013	応用力学特別演習 E	Advanced Exercise in Applied Mechanics E
W015	応用力学特別演習 F	Advanced Exercise in Applied Mechanics F
W017	構造工学実験法	Strucutual Testing Technology
W019	インターンシップM（応用力学）	Engineering Internship M
W021	インターンシップDS（応用力学）	Engineering Internship DS
W023	インターンシップDL（応用力学）	Engineering Internship DL
W025	応用力学セミナーA	Seminar on Applied Mechanics A
W027	応用力学セミナーB	Seminar on Applied Mechanics B
融合工学コース / Interdisciplinary Engineering Course Program - 物質機能・変換科学分野 / Laboratory of Materials Engineering and Chemistry		
H403	ディメンジョンの制御とナノ・マイクロ化学	Dimensional Control and Micro-Nano Systems
H404	分子機能と複合・集積機能	Molecular Function and Composite-Assembly Function
H412	先端二次電池	Advances in Rechargeable Batteries
H444	Mathematics and Numerical Computing	Mathematics and Numerical Computing
H446	English for Debate and Communications	English for Debate and Communications
H470	JGP国際インターンシップⅠ（短期）	JGP International Internship I
H471	JGP国際インターンシップⅡ（中期）	JGP International Internship II
H472	JGP国際インターンシップⅢ（長期）	JGP International Internship III
P448	JGPセミナーⅠ	Japan Gateway Project Seminar I
P450	JGPセミナーⅡ	Japan Gateway Project Seminar II
P452	JGPセミナーⅢ	Japan Gateway Project Seminar III
P454	JGPセミナーⅣ	Japan Gateway Project Seminar IV
P456	JGPセミナーⅤ	Japan Gateway Project Seminar V
P457	JGPセミナーⅥ	Japan Gateway Project Seminar VI
P459	JGPセミナーⅦ	Japan Gateway Project Seminar VII
P461	JGPセミナーⅧ	Japan Gateway Project Seminar VIII
P463	JGPセミナーⅨ	Japan Gateway Project Seminar IX
P465	JGPセミナーⅩ	Japan Gateway Project Seminar X
P467	JGPセミナーⅪ	Japan Gateway Project Seminar XI
P469	JGPセミナーⅫ	Japan Gateway Project Seminar XII
P470	JGP計算実習(CFD)	Japan Gateway Project Computation Exercise(CFD)
W432	物質機能・変換科学特別実験及演習Ⅰ	Laboratory and Exercise on Materials Engineering and Chemistry I
W433	物質機能・変換科学特別実験及演習Ⅱ	Laboratory and Exercise on Materials Engineering and Chemistry II
W434	物質機能・変換科学特別実験及演習Ⅲ	Laboratory and Exercise on Materials Engineering and Chemistry III
W435	物質機能・変換科学特別実験及演習Ⅳ	Laboratory and Exercise on Materials Engineering and Chemistry IV
W437	物質機能・変換科学特別セミナーⅠ	Advanced Seminar on Materials Engineering and Chemistry I
W438	物質機能・変換科学特別セミナーⅡ	Advanced Seminar on Materials Engineering and Chemistry II
W439	物質機能・変換科学特別セミナーⅢ	Advanced Seminar on Materials Engineering and Chemistry III
W440	物質機能・変換科学特別セミナーⅣ	Advanced Seminar on Materials Engineering and Chemistry IV
W441	物質機能・変換科学特別セミナーⅤ	Advanced Seminar on Materials Engineering and Chemistry V
W442	物質機能・変換科学特別セミナーⅥ	Advanced Seminar on Materials Engineering and Chemistry VI
融合工学コース / Interdisciplinary Engineering Course Program - 生命・医工融合分野 / Laboratory of Engineering for Life Science and Medicine		
W606	画像診断学	Diagnostic Imaging
W641	生理学	Physiology
W652	医学物理学	Medical Physics
W670	生命医工分野セミナーA(修士)	Seminar on Bio-Medical Engineering A (MC)
W671	生命医工分野セミナーB(修士)	Seminar on Bio-Medical Engineering B (MC)
W681	生命・医工分野特別実験および演習第一	Experiments and Exercises on Bio-Medical Engineering, Adv. I
W683	生命・医工分野特別実験および演習第二	Experiments and Exercises on Bio-Medical Engineering, Adv. II
W685	生命・医工分野特別セミナーA	Seminar on Bio-Medical Engineering A
W687	生命・医工分野特別セミナーB	Seminar on Bio-Medical Engineering B

科目コード /Code	科目名(和文) / Course Title	
W689	生命・医工分野特別セミナーC	Seminar on Bio-Medical Engineering C
W690	生命・医工分野特別セミナーD	Seminar on Bio-Medical Engineering D
W691	インターンシップM（生命・医工）	Bio-Medical Engineering Internship M
W692	インターンシップD（生命・医工）	Bio-Medical Engineering Internship D
融合工学コース / Interdisciplinary Engineering Course Program		
- 融合光・電子科学創成分野 / Laboratory of Interdisciplinary Photonics and Electronics		
X001	融合光・電子科学の展望	Prospects of Interdisciplinary Photonics and Electronics
X003	融合光・電子科学特別実験及演習 1	Advanced Experiments and Exercises in Interdisciplinary Photonics and Electronics I
X005	融合光・電子科学特別実験及演習 2	Advanced Experiments and Exercises in Interdisciplinary Photonics and Electronics II
X007	融合光・電子科学特別セミナー	Advanced Seminar on Interdisciplinary Photonics and Electronics
X009	融合光・電子科学通論	Recent Advances in Interdisciplinary Photonics and Electronics
X015	融合光・電子科学特別研修1(インターン)	Advanced Seminar in Interdisciplinary Photonics and Electronics I
X017	融合光・電子科学特別研修2(インターン)	Advanced Seminar in Interdisciplinary Photonics and Electronics II
X019	研究インターンシップM(融合光)	Research Internship (M)
X021	研究インターンシップD(融合光)	Research Internship (D)
X023	融合光・電子科学特別演習1	Advanced Exercises on Interdisciplinary Photonics and Electronics I
X025	融合光・電子科学特別演習2	Advanced Exercises on Interdisciplinary Photonics and Electronics II
融合工学コース / Interdisciplinary Engineering Course Program		
- 人間安全保障工学分野 / Laboratory of Human Security Engineering		
X301	人間安全保障工学概論	Human Security Engineering
X305	都市ガバナンス学各論 1	Lectures in Urban Governance 1
X307	都市ガバナンス学各論 2	Lectures in Urban Governance 2
X315	都市基盤マネジメント学各論1	Lectures in Urban Infrastructure Management 1
X317	都市基盤マネジメント学各論2	Lectures in Urban Infrastructure Management 2
X323	健康リスク管理学各論1	Lectures in Health Risk Management 1
X325	健康リスク管理学各論2	Lectures in Health Risk Management 2
X335	災害リスク管理学各論1	Lectures in Disaster Risk Management 1
X337	災害リスク管理学各論2	Lectures in Disaster Risk Management 2
X339	人間安全保障工学インターンシップ	Internship for Human Security Engineering
X341	アドバンスド・キャップストーン・プロジェクト	Advanced Capstone Project
X351	人間安全保障工学セミナーA	Human Security Engineering Seminar A
X352	人間安全保障工学セミナーB	Human Security Engineering Seminar B
融合工学コース / Interdisciplinary Engineering Course Program		
- デザイン学分野 / Laboratory of Design Science		
V202	微小電気機械創製学	Introduction to the Design and Implementation of Micro-Systems
X433	情報システムデザイン	Information Systems Design
X434	防災・減災デザイン論	Designs for Emergency Management
X436	計算論的学習理論	Computational Learning Theory
X438	統計的学習理論	Statistical Learning Theory
X442	分散情報システム	Distributed Information Systems
X451	デザインエスノグラフィ	Design Ethnography
X456	マーケティングリサーチ	Marketing Research
X462	心理システムデザイン演習 I	Seminar on Psychology and Design Studies I
X463	心理システムデザイン演習 II	Seminar on Psychology and Design Studies II
X464	心理デザインデータ解析演習	Seminar on Data Analysis in Psychology and Design Studies
X465	認知機能デザイン論	Design of Cognitive Functions
X466	デザイン心理学特論	Advanced Studies: Cognitive Sciences
X467	脳機能デザイン演習	Seminar on Brain Function and Design Studies
X468	問題発見型/解決型学習(FBL/PBL)S 1	Field based Learning/Problem based Learning (FBL/PBL) S1
X469	問題発見型/解決型学習(FBL/PBL)S 2	Field based Learning/Problem based Learning (FBL/PBL) S2
X477	問題発見型/解決型学習(FBL/PBL)L 1	Field based Learning/Problem based Learning (FBL/PBL) L1
X478	問題発見型/解決型学習(FBL/PBL)L 2	Field based Learning/Problem based Learning (FBL/PBL) L2
X479	フィールドインターンシップL（デザイン学）	Filed Internship L
X480	リサーチインターンシップL（デザイン学）	Research-Intensive Abroad Internship L
X481	デザイン学特別演習I	Design Science Exercise, Adv. 1
X482	デザイン学特別演習II	Design Science Exercise, Adv. 2
X483	オープンイノベーション実習 1	Open Innovation Practice 1
X484	オープンイノベーション実習 2	Open Innovation Practice 2
X490	デザイン学コミュニケーションストラテジー	Communication Strategies for Design Research
X728	フィールド分析法	Field Analysis
X732	パターン認識特論	Pattern Recognition, Adv.
X733	言語情報処理特論	Language Information Processing, Adv.
融合工学コース / Interdisciplinary Engineering Course Program		
- 総合医療工学分野 / Laboratory of Integrated Medical Engineering		
X604	材料化学基礎	Basic Material Chemistry
X605	生物分子解析学	Molecular Analysis of Life
X671	総合医療工学分野特別実験および演習第一	Experiments and Exercises on Integrated Medical Engineering, Adv. I
X672	総合医療工学分野特別実験および演習第二	Experiments and Exercises on Integrated Medical Engineering, Adv. II
X681	総合医療工学分野セミナー A(修士)	Integrated Medical Engineering Seminar A
X682	総合医療工学分野セミナー B(修士)	Integrated Medical Engineering Seminar B
X683	総合医療工学分野特別セミナーA	Special Seminar A on Integrated Medical Engineering
X684	総合医療工学分野特別セミナーB	Special Seminar B on Integrated Medical Engineering
X685	総合医療工学分野特別セミナーC	Special Seminar C on Integrated Medical Engineering
X686	総合医療工学分野特別セミナーD	Special Seminar D on Integrated Medical Engineering



<b>Course number</b>	G-ENG90 8i010 PE20				
<b>Course title (and course title in English)</b>	工学研究科国際インターンシップ 1 International Internship in Engineering 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, HONDA MITSURU	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
By registering and completing the course requirement, one may receive academic credit from participating in an internship program or related activities overseas. One credit will be awarded for those who spent abroad no more than three months.					
<b>[Course objectives]</b>					
The course is intended to encourage students to acquire both the skills (e.g., language, negotiation, and leadership) and international mind-set (i.e., cross-cultural competency) by embracing activities in a country other than their own.					
<b>[Course schedule and contents]</b>					
First, check whether a similar internship course is available at your department.					
If not, carefully read the guideline before registration to see whether you qualify for this course as follows.					
Prospective students					
-must be registered for the course before its deadline.					
-must submit the proposal for the "International Internship I" at least one month prior to the time of departure for a review by academic staff at the ER Centre for approval. (sample form available)					
-must submit the certificate (a letter) of completion of the program or similar upon the completion of the internship program.					
-must present the outcomes of the program in English for 15 minutes to be evaluated.					
<b>[Course requirements]</b>					
Prospective students					
-must be qualified to participate in a program (e.g., language proficiency level)					
-must submit the "Oversea Travel Notification" to the administrative office.					
-must provide evidence that he or she has purchased "Oversea Travel Insurance."					
Continue to 工学研究科国際インターンシップ 1 (2)					

工学研究科国際インターンシップ 1 (2)

**[Evaluation methods and policy]**

Will be evaluated as pass or fail.

**[Textbooks]**

Not used

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

Please consult with your supervisor about your proposal before submitting it to us.

**( Other information (office hours, etc.) )**

For further inquiry, please contact: nishikawa.mikako.7w@kyoto-u.ac.jp

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG90 8i011 PE20				
<b>Course title (and course title in English)</b>	工学研究科国際インターンシップ 2 International Internship in Engineering 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, HONDA MITSURU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
By registering and completing the course requirement, one may receive academic credit from participating in an internship program or related activities overseas. Two credits will be awarded for those who spent abroad more than three months.					
<b>[Course objectives]</b>					
The course is intended to encourage students to acquire both the skills (e.g., language, negotiation, and leadership) and international mind-set (i.e., cross-cultural competency) by embracing activities in a country other than their own for a longer period of time.					
<b>[Course schedule and contents]</b>					
First, check whether a similar internship course is available at your department.					
If not, carefully read the guideline before registration to see whether you qualify for this course as follows.					
Prospective students					
-must be registered for the course before its deadline.					
-must submit the proposal for the "International Internship I" at least one month prior to the time of departure for a review by academic staff at the ER Centre for approval. (sample form available)					
-must submit the certificate (a letter) of completion of the program or similar upon the completion of the internship program.					
-must present the outcomes of the program in English for 15 minutes to be evaluated.					
<b>[Course requirements]</b>					
Prospective students					
-must be qualified to participate in a program (e.g., language proficiency level)					
-must submit the "Oversea Travel Notification" to the administrative office.					
-must provide evidence that he or she has purchased "Oversea Travel Insurance."					
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Continue to 工学研究科国際インターンシップ 2(2)					

工学研究科国際インターンシップ 2 (2)

**[Evaluation methods and policy]**

Will be evaluated as pass or fail.

**[Textbooks]**

Not used

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

Please consult with your supervisor before submitting your proposal to us.

**( Other information (office hours, etc.) )**

For further inquiry, please contact: nishikawa.mikako.7w@kyoto-u.ac.jp

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG95 8i041 SE20				
<b>Course title (and course title in English)</b>	科学技術者のためのプレゼンテーション演習 Professional Scientific Presentation Exercises		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI Graduate School of Engineering Senior Lecturer,hirai yoshikazu Graduate School of Engineering Professor,HONDA MITSURU	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The aim of this exercise is to provide master's and doctoral students with presentation and discussion skills in presenting science and technology to non-specialist science and technology professionals and the general public as required by science and technology professionals.					
<b>[Course objectives]</b>					
Students develop more advanced presentation skills in order to explain omplex and technical matters more simply and to answer questions.					
<b>[Course schedule and contents]</b>					
Guidance, special lectures by external lecturers, exercises (6 sessions) Oral presentation and discussion I (3 sessions) Oral presentation and discussion II (3 sessions) Oral presentation and discussion III (3 sessions)					
<b>[Course requirements]</b>					
Basic presentation skills in English, English conversation skills, publishable research achievements, conference presentation manuscripts, class reports and seminar materials					
<b>[Evaluation methods and policy]</b>					
The presentation and discussion will be assessed comprehensively.					
<b>[Textbooks]</b>					
Instructed during class Materials will be distributed as appropriate.					
<b>[References, etc.]</b>					
( Reference books ) 野口ジュディら 『理系たまごシリーズ 理系英語のプレゼンテーション Ver. 2』 ( アルク、2020 )					
----- Continue to 科学技術者のためのプレゼンテーション演習(2) -----					



科学技術者のためのプレゼンテーション演習(2)

ISBN:4757436467

**( Related URLs )**

(ERセンターホームページに開設予定。)

**[Study outside of class (preparation and review)]**

Students are required to bring their own research results, conference papers, class reports and seminar materials for presentation.

**( Other information (office hours, etc.) )**

The course is open to Master's and Doctoral students and, in principle, will be conducted entirely in English. Students who wish to take this course should register in advance via the website provided. Due to the nature of the lecture, the course will only be offered if there are at least four students enrolled. If there are too many applicants, the number of students may be limited (maximum 30). The course will be held over five days from 30 August to 3 September.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG90 8i042 SE20				
<b>Course title (and course title in English)</b>	工学と経済（上級） Advanced Engineering and Economy		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, Juha Lintuluoto	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>Engineering economics plays central role in any industrial engineering project. For an engineer, it is important to apply the engineering know-how with the economic analysis skills to obtain the best available materials, methods, devices, etc. in the most economical way. This course is aimed to teach engineering students the basic economic methods to manage economically an engineering project. In addition, the report writing on various engineering economic issues prepares to write reports in a professional form. The lab sessions are meant for the verbal skills improvement as well as improvement of analytical thinking. The topics are of current relevant topics Small-group brain-storming method is used. The exercise sessions cover the use of Ms-Excel for various quantitative economic analyses.</p>					
<b>[Course objectives]</b>					
<p>This course is aimed to strengthen engineering students's skills in economics. The course concept is to teach students selectively those subjects which serve as major tools to solve economic tasks in engineering environment. The reports and lab sessions provide students stimulating and analytical thinking requiring tasks, and presentation skills training is an important part of this course.</p>					
<b>[Course schedule and contents]</b>					
<p>Student orientation and Introduction to engineering economy, 1time, Course contents, goals  Cost concepts and design economics, 1time, Cost terminology and classification  Cost estimation techniques, 1time, WBS for cost estimation, estimation techniques (indexes, unit, factor, power-sizing, learning curve, CER, top down, bottom up), target costing  The time value of money, 1time, Simple interest, compound interest, economic equivalence concept, cash-flow diagrams, PW, FW, AW  Evaluating a single project, 1time, MARR, present worth method, bond value, capitalized worth, internal rate of return, external rate of return, payback method  Comparison and selection among alternatives, 1time, Investment and cost alternatives, study period, equal and unequal useful lives, rate-of-return method, imputed market value  Depreciation and income taxes, 1time, SL and DB depreciation methods, book value, after-tax MARR, marginal income tax rate, gain(loss) on asset disposal, after-tax economic analysis general procedure, EVA,  Price changes and exchange rates, 1time, Actual dollars, real dollars, inflation, fixed and responsive annuities, exchange rates, purchasing power  Replacement analysis, 1time, Determining economic life of challenger, determining economic life of defender, abandonment, after-tax replacement study  Evaluating projects with the benefit-cost ratio method, 1time, Benefits, costs, dis-benefits, self-liquidating projects, multi-purpose projects, interest rate vs. public project, conventional B-C ratio PW and AW method, modified B-C ratio PW and AW method  Breakeven and sensitivity analysis, 1time, Breakeven analysis, sensitivity analysis, spider plot</p>					
Continue to 工学と経済（上級）(2)					

## 工学と経済（上級）(2)

Probabilistic risk analysis, 1time, Sources of uncertainty, discrete and continuous variables, probability trees, Monte Carlo simulation example, decision trees, real options analysis

The capital budgeting process, 1time, Capital financing and allocation, equity capital and CAPM, WACC, WACC relation to MARR, opportunity cost

Decision making considering multiattributes, 1time, Non-compensatory models (dominance, satisficing, disjunctive resolution, lexicography), compensatory models (non-dimensional scaling, additive weight)

Final test, 1time, 90 minutes, concept questions, calculation task (option of choice)

,times, Additionally, students will submit three reports during the course on given engineering economy subjects. Also, required are the five lab participations (ca.60 min/each) for each student. Additionally, three exercise sessions (ca.60 min/each), where use of Ms-Excel will be practiced for solving various engineering economy tasks, should be completed

### [Course requirements]

-This course is highly recommended for those who attend "Project Management in Engineering course", Small group working method

### [Evaluation methods and policy]

Final test, reports, class activity

### [Textbooks]

Engineering Economy 15th ed. William G. Sullivan (2011)

### [References, etc.]

#### （ Reference books ）

Will be informed if necessary.

#### （ Related URLs ）

(The web-site is listed in the home page of the GL education center.)

### [Study outside of class (preparation and review)]

### （ Other information (office hours, etc.) ）

Students are requested to check in advance whether the credits of this course are counted as the units for graduation requirement at department level. The course starts on Oct.2nd.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG90 8i045 SE20			
<b>Course title (and course title in English)</b>	実践的科学英語演習 Exercise in Practical Scientific English I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,HONDA MITSURU Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI Graduate School of Engineering Senior Lecturer,hirai yoshikazu	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course is open to all master's and doctoral engineering students. It is designed to help students understand how to write a research proposal step by step. The students will write a short research proposal on a topic drawn from assigned readings from science magazines in this course.					
<b>[Course objectives]</b>					
The primary goal of this course is to deepen an understanding of the main features of each part of a scientific paper (IMRaD). Students will develop the core competencies required for language, grammar, and style to produce a research manuscript in English throughout the course.					
<b>[Course schedule and contents]</b>					
<p>Course Overview</p> <p>Week 1: Introduction to writing scientific research articles</p> <p>Introduction</p> <p>Week 2: Researching a scientific topic and understanding the scientific register (genre, audience, purpose)</p> <p>Preparing to Write</p> <p>Week 3: Building a hypothesis and designing an experiment</p> <p>Week 4: Discussing and evaluating proposals for experiments</p> <p>Synthesizing</p> <p>Week 5: Awareness of the register of scientific research articles (Exercise: Creating ow Corpus)</p> <p>Week 6: Using citations and references for a formal writing</p> <p>Writing Processes</p> <p>Week 7: Writing Titles, Abstract of the proposed research</p> <p>Week 8: Writing an Introduction section</p> <p>Week 9: Writing a Method section</p> <p>Week10: Writing an Anticipated Results &amp; Implication section</p> <p>Week11: Writing a Budget, time schedule section</p> <p>Week12: Writing a cover letter to reviewers and how to respond to reviewers</p> <p>Week13: Revising a paper based on peer feedback</p> <p>Monitoring and Revising</p> <p>Week14: Online feedback</p>					
----- Continue to 実践的科学英語演習 (2) -----					

## 実践的科学英語演習 (2)

Week15:Online feedback

### [Course requirements]

None

### [Evaluation methods and policy]

Evaluation based on 30% in-class participation, 40% reports, 30% final paper

\*More than twice unexcused absence can result in course failure.

### [Textbooks]

Instructed during class

The instructor will supply handout materials.

The course may switch from in-person to remote if necessary.

### [References, etc.]

#### ( Reference books )

Textbook (Supplemental)

ALESS (2012). Active English for Science-英語で科学する-レポート、論文、プレゼンテーション.  
The University of Tokyo Press.

Cargill, M., & O'Connor, P. (2013). Writing scientific research articles: Strategy and steps. John Wiley & Sons.

Cowell, R., & She, L. (2015). Mastering the Basics of Technical English 『技術英語の基礎』

. 2nd Ed., Corona Publishing.

野口ジュディー・深山晶子・岡本真由美. (2007). 『理系英語のライティング』. アルク

### [Study outside of class (preparation and review)]

Students who intend to join this course must attend the first class.

Tutorial sessions will be provided online.

### ( Other information (office hours, etc.) )

Students who intend to join this course must attend the first class.

Office Hours: (by appointment) nishikawa.mikako7w@kyoto-u.ac.jp (Ext. 2052)

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>		G-ENG90 8i046 SE20			
<b>Course title (and course title in English)</b>	实践的科学英語演習 Exercise in Practical Scientific English II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, hirai yoshikazu Graduate School of Engineering Associate Professor, Juha Lintuluoto Graduate School of Engineering Associate Professor, Cedric Tassel Graduate School of Engineering Senior Lecturer, Lim, Sunghoon Graduate School of Engineering Senior Lecturer, LANDENBERGER, Kira Beth Graduate School of Engineering Senior Lecturer, DE ZOYSA, Menaka Graduate School of Engineering Senior Lecturer, BANERJEE, Amit	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a seminar course for master's and doctoral students to learn how to make logical and effective presentations in English, and to gain the ability to present at international conferences actively. In particular, this course aims to provide students with the skills to make effective and easy-to-understand presentations in English so that they can present the content of their research (background, objectives, experiments/analysis, discussion, and conclusions) to an audience that is not from their field of expertise. At the same time, students will learn communication skills to respond well to question and answer sessions in order to gain interest in their research topics. In this lecture, foreign professors will review the students' presentations, ask questions and make comments, as well as provide feedback on the content and style of the presentations, in Japanese as appropriate.					
<b>[Course objectives]</b>					
Students will learn how to make English presentations through three approaches: theory, analysis, and practice. Specifically, students will practice with foreign professors from the three perspectives of "principles of English presentation," "preparation for presentation according to purpose," and "practice of English presentation and poster presentation" in order to obtain English presentation skills.					
<b>[Course schedule and contents]</b>					
The course is constituted of three main parts:					
Part 1. Introduction to Effective Presentation (2 classes) A lecture is given on how to prepare an effective presentation.					
Part 2. Oral presentation (10 classes) Each participant will give a presentation in English, and the foreign instructor will focus on the following points. Comments and feedback will be provided. In this way, students will acquire persuasive and effective presentation techniques.					
1. Clear presentation method?					
2. Logical flow and content structure that is easy to understand, even if the content is new to the audience?					
3. Useful scientific and technical expressions are used?					
----- Continue to 实践的科学英語演習 (2) -----					

## 实践的科学英語演習 (2)

4. Use of techniques to attract the attention of the audience?

Part 3. Oral and Poster presentations (3 classes)

Based on the presentation exercises in Part I & II, each student will give a presentation (oral or poster) in English.

### [Course requirements]

1. This course is mainly held in English. Students are expected to actively engage in class discussions.
2. In order to maximize the effectiveness of group work, we may set a minimum number of students and limit the total number of participants.

### [Evaluation methods and policy]

Evaluation:

40% participation (engaging the Q&As)

60% oral and poster presentations

### [Textbooks]

Handout materials will be supplied by the instructor.

### [References, etc.]

#### ( Reference books )

Introduced during class

#### ( Related URLs )

(None)

### [Study outside of class (preparation and review)]

Please make preparations for practical use based on the basics of scientific presentation, and improve your skills through group work.

### ( Other information (office hours, etc.) )

Students who intend to join this course must attend the first class.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG90 8i049 LE77			
<b>Course title (and course title in English)</b>	エンジニアリングプロジェクトマネジメント Project Management in Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,hirai yoshikazu Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI Graduate School of Engineering Associate Professor,Juha Lintuluoto	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course provides a basic knowledge required for the project management in various engineering fields such as process design, plant design, construction, and R&D project. Some lectures are provided by visiting lecturers from industry and public works who have many experiences on actual engineering projects.					
<b>[Course objectives]</b>					
This course will help students gain a fundamental knowledge of what project management in engineering is. Throughout the course, students will learn various tools applied in project management. Students will also understand the importance of costs and money, risks, leadership, and environmental assessment in managing engineering projects. This course is followed with the course Exercise on Project Management in Engineering in the second semester.					
<b>[Course schedule and contents]</b>					
Week 1, Course guidance Week 2, Introduction of project management Week 3, Project management in the case of Japanese ODA Week 4-5, Team organization and administration Week 6-8, Tools for project management, cost, and cash flows Week 9, Negotiation skills/tactics/examples in business marketing Week 10, Environmental impact assessment Week 11, The work stages of architectural design projects in UK Week 12, Scheduling Week 13, Project management for engineering projects Week 14, Project management for engineering business Week 15, Feedback The schedule is subject to change.					
-----					
Continue to エンジニアリングプロジェクトマネジメント(2)					

## エンジニアリングプロジェクトマネジメント(2)

### [Course requirements]

We may restrict the class size to enhance students' learning.  
Students who intend to take this course are requested to attend the first lecture.

### [Evaluation methods and policy]

Evaluated by class contribution (or level of understanding) at each class (60%) and assignments (40%)

### [Textbooks]

Course materials will be provided.

### [References, etc.]

#### ( Reference books )

Lock, Dennis 『Project Management, 10th edition』 ( Gower Publishing Ltd. ) ISBN:1409452697  
Cleland, David L., and Ireland, Lewis R. 『Project Management: Strategic Design and Implementation, 5th edition』 ( McGraw-Hill Professional ) ISBN:007147160X  
Miller, Roger and Lessard, Donald R. 『The strategic management of large engineering projects, Shaping Institutions, Risks, and Governance』 ( The MIT Press ) ISBN:9780262526982

#### ( Related URLs )

<http://www.glc.t.kyoto-u.ac.jp/grad/>(The home page of the engineering education research center)

### [Study outside of class (preparation and review)]

This course requests students to prepare a class in advance because some classes will be done by an interactive style as necessary.

### ( Other information (office hours, etc.) )

We may restrict the class size to enhance students' learning.  
Students who intend to take this course are requested to attend the first lecture.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG95 8i051 SJ20			
<b>Course title (and course title in English)</b>	現代科学技術の巨人セミナー「知のひらめき」(6Hコース) Frontiers in Modern Science and Technology (6H course)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, TAKATSU HIROSHI Graduate School of Engineering Professor, HONDA MITSURU	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course provides lectures and panel discussions by lecturers inside and outside the campus who have a remarkable achievement in engineering and are active as international leaders.					
<b>[Course objectives]</b>					
This course cultivates the ability to develop familiar problem consciousness into a big concept through utilizing the materials of advanced fields in each field. This course also shows how leaders have improved their response to problems. Through this course, students learn fundamental culture, and the importance of human growth.					
<b>[Course schedule and contents]</b>					
Topic 1, 2 times, Detail will be announced later Topic 2, 2 times, Detail will be announced later					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Separate four classes will be provided. One class has three hours. Each class will assign a report. Evaluation bases on the assignment and class contribution. The classes will be opened on Saturdays. In 6H course, students have to select two classes and will earn 0.5 credits.					
<b>[Textbooks]</b>					
Course materials will be provided.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Will be indicated as necessary.					
<b>[Study outside of class (preparation and review)]</b>					
Will be indicated as necessary.					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>		G-ENG95 8i052 SJ20			
<b>Course title (and course title in English)</b>	現代科学技術の巨人セミナー「知のひらめき」(12Hコース) Frontiers in Modern Science and Technology (12H course)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, TAKATSU HIROSHI Graduate School of Engineering Professor, HONDA MITSURU	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course provides lectures and panel discussions by lecturers inside and outside the campus who have a remarkable achievement in engineering and are active as international leaders.					
<b>[Course objectives]</b>					
This course cultivates the ability to develop familiar problem consciousness into a big concept through utilizing the materials of advanced fields in each field. This course also shows how leaders have improved their response to problems. Through this course, students learn fundamental culture, and the importance of human growth.					
<b>[Course schedule and contents]</b>					
Topic 1, 2 times, Detail will be announced later Topic 2, 2 times, Detail will be announced later Topic 3, 2 times, Detail will be announced later Topic 4, 2 times, Detail will be announced later					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Separate four classes will be provided. One class has three hours. Each class will assign a report. Evaluation bases on the assignment and class contribution. The classes will be opened on Saturdays. In 12H course, students have to complete all four classes and will earn 1 credits.					
<b>[Textbooks]</b>					
Course materials will be provided.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Will be indicated as necessary.					
<b>[Study outside of class (preparation and review)]</b>					
Will be indicated as necessary.					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG90 8i055 LE77			
<b>Course title (and course title in English)</b>	現代科学技術特論（4回コース） Advanced Modern Science and Technology (4 times course)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI Graduate School of Engineering Senior Lecturer,ISLAM, A K M Mahfuzul Graduate School of Engineering Senior Lecturer,NAKADA NORIHIDE Graduate School of Engineering Assistant Professor,GOMI RYOUTA Graduate School of Engineering Assistant Professor,TONOMURA OSAMU Graduate School of Engineering Assistant Professor,MOLINA LOPEZ, John Jairo Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering Associate Professor,Yi Wei Graduate School of Engineering Assistant Professor,NAMURA KYOKO Graduate School of Engineering Senior Lecturer,BANERJEE, Amit Graduate School of Engineering Professor,HONDA MITSURU	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. Assignment will be done for further understanding of the topics of the course. See website for further information. <a href="http://www.glc.t.kyoto-u.ac.jp/class/amst2021">http://www.glc.t.kyoto-u.ac.jp/class/amst2021</a>					
<b>[Course objectives]</b>					
The students understand of each technology towards social issues to be solved by engineers. In addition, the students learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development.					
<b>[Course schedule and contents]</b>					
Topic A: Week 1-4, Water Environment & Nano Technology Topic B: Week 5-8, Light and energy					
----- Continue to 現代科学技術特論（4回コース）(2) -----					

## 現代科学技術特論（4回コース）(2)

Topic C:

Week 9-12, Numerical Simulation

### [Course requirements]

Each topic consists of four lectures.

This course requests to choose one topic from provided three topics in advance.

It is prohibited to change the topic after registration.

We may select students who can attend the class before starting the class.

Students who intend to join the course are required to submit the application form through the web site which will be informed in the advance.

See website for further information. <https://www.glc.t.kyoto-u.ac.jp/grad>

### [Evaluation methods and policy]

The average score of the best two assignments is employed.

For the topic which the students chose, they must attend minimum three lectures and submit minimum two assignments evaluated as "passed".

### [Textbooks]

Course materials will be provided.

### [References, etc.]

（ Reference books ）

（ Related URLs ）

<http://www.glc.t.kyoto-u.ac.jp/grad>(The home page of the engineering education research center)

### [Study outside of class (preparation and review)]

This course requests students to prepare a class in advance because some classes will be done by an interactive style.

### （ Other information (office hours, etc.) ）

It is prohibited to change the registered course.

It is prohibited to attend the lectures of the other topics than the students chose.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG90 8i056 LE77			
<b>Course title (and course title in English)</b>	現代科学技術特論（8回コース） Advanced Modern Science and Technology (8 times course)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI Graduate School of Engineering Senior Lecturer,ISLAM, A K M Mahfuzul Graduate School of Engineering Senior Lecturer,NAKADA NORIHIDE Graduate School of Engineering Assistant Professor,GOMI RYOUTA Graduate School of Engineering Assistant Professor,TONOMURA OSAMU Graduate School of Engineering Assistant Professor,MOLINA LOPEZ, John Jairo Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering Associate Professor,Yi Wei Graduate School of Engineering Assistant Professor,NAMURA KYOKO Graduate School of Engineering Senior Lecturer,BANERJEE, Amit Graduate School of Engineering Professor,HONDA MITSURU	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. Assignment will be done for further understanding of the topics of the course.					
<b>[Course objectives]</b>					
The students understand of each technology towards social issues to be solved by engineers. In addition, the students learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development.					
<b>[Course schedule and contents]</b>					
Topic A: Week 1-4, Water Environment & Nano Technology Topic B: Week 5-8, Light and energy Topic C:					
Continue to 現代科学技術特論（8回コース）(2)					

## 現代科学技術特論（8回コース）(2)

Week 9-12, Numerical Simulation

See website for further information. <http://www.glc.t.kyoto-u.ac.jp/class/amst2021>

### [Course requirements]

Each topic consists of four lectures.

This course requests to choose two topics from provided three topics in advance.

It is prohibited to change the topics after registration.

We may select students who can attend the class before starting the class.

Students who intend to join the course are required to submit the application form through the web site which will be informed in the advance.

See website for further information. <https://www.glc.t.kyoto-u.ac.jp/grad>

### [Evaluation methods and policy]

The average score of the best two assignments for each topic is employed.

For each topic which the students chose, they must attend minimum three lectures and submit minimum two assignments evaluated as "passed".

### [Textbooks]

Course materials will be provided.

### [References, etc.]

（ Reference books ）

（ Related URLs ）

<http://www.glc.t.kyoto-u.ac.jp/grad>(The home page of the engineering education research center)

### [Study outside of class (preparation and review)]

This course requests students to prepare a class in advance because some classes will be done by an interactive style.

### （ Other information (office hours, etc.) ）

It is prohibited to change the registered course.

It is prohibited to attend the lectures of the other topic than the students chose.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG90 8i057 LJ20					
<b>Course title (and course title in English)</b>	安全衛生工学（４回コース） Safety and Health Engineering (4 times course)		<b>Instructor's name, job title, and department of affiliation</b>	Agency for Health, Safety and Environment Professor, HASHIMOTO SATOSHI Agency for Health, Safety and Environment Professor, MATSUI YASUTO		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,1time, ,1time, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG90 8i058 LJ20			
<b>Course title (and course title in English)</b>	安全衛生工学（11回コース） Safety and Health Engineering (11 times course)		<b>Instructor's name, job title, and department of affiliation</b>	Agency for Health, Safety and Environment Professor, HASHIMOTO SATOSHI Agency for Health, Safety and Environment Professor, MATSUI YASUTO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
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Continue to 安全衛生工学（11回コース）(2)					



安全衛生工学（11回コース）(2)

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[Study outside of class (preparation and review)]

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG90 8i059 LE77				
<b>Course title (and course title in English)</b>	エンジニアリングプロジェクトマネジメント演習 Exercise on Project Management in Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,hirai yoshikazu Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI Graduate School of Engineering Associate Professor,Juha Lintuluoto	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Students will apply the engineering know-how and the skills of management, and group leadership which they learned in the course of Project Management in Engineering to build and carry out a virtual inter-engineering project. This course provides a forum where students' team-plan based on ideas and theories, decision making, and leadership should produce realistic engineering project outcomes. The course consists of intensive group work, presentations, and a few intermediate discussions. A written report will be required.					
<b>[Course objectives]</b>					
This course prepares engineering students to work with other engineers within a large international engineering project. In particular this course will focus on leadership and management of projects along with applied engineering skills where the students learn various compromises, co-operation, responsibility, and ethics.					
<b>[Course schedule and contents]</b>					
<p>Week 1, Introduction to Exercise on Project Management in Engineering, Lecture on tools for the Project management in engineering, Practice and Project proposal.</p> <p>Week 2, Group finalizations &amp; Project selections.</p> <p>Week 3-7, Group work, Project preliminary structures, Task list, WBS, Cost, Gant chart.</p> <p>Week 8, Mid-term presentation.</p> <p>Week 9-11, Group work, Leadership structuring, Risk Management, Environmental Impact Assessment.</p> <p>Week 12, Presentation.</p> <p>Each project group may freely schedule the group works within given time frame. The course instructors are available if any need is required.</p> <p>Some lectures will be provided such as Task list, WBS, Cost, Gant chart, Leadership structuring, Risk Management, Environmental Impact Assessment, and more.</p>					
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Continue to エンジニアリングプロジェクトマネジメント演習(2)					

## エンジニアリングプロジェクトマネジメント演習(2)

### [Course requirements]

Fundamental skills about group leading and communication, scientific presentation.  
We may restrict the class size to enhance students' learning.  
Students who intend to join the course are required to attend the first class.

### [Evaluation methods and policy]

Report, presentations, class activity (at least 10 times attendance including mid-term and final presentations).

### [Textbooks]

Not used  
If necessary, course materials will be provided.

### [References, etc.]

#### ( Reference books )

Will be informed if necessary.

#### ( Related URLs )

<http://www.glc.t.kyoto-u.ac.jp/grad/>((The home page of the engineering education research center))

### [Study outside of class (preparation and review)]

Students are requested to prepare for group work, mid-term presentation and final presentation.

### ( Other information (office hours, etc.) )

We may restrict the class size to enhance students' learning.  
Students who intend to join the course are required to attend the first class.

\*Please visit KULASIS to find out about office hours.

Course number		G-ENG90 8i060 LE77			
Course title (and course title in English)	現代科学技術特論（12回コース） Advanced Modern Science and Technology (12 times course)		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI Graduate School of Engineering Senior Lecturer,ISLAM, A K M Mahfuzul Graduate School of Engineering Senior Lecturer,NAKADA NORIHIDE Graduate School of Engineering Assistant Professor,GOMI RYOUTA Graduate School of Engineering Assistant Professor,TONOMURA OSAMU Graduate School of Engineering Assistant Professor,MOLINA LOPEZ, John Jairo Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering Associate Professor,Yi Wei Graduate School of Engineering Assistant Professor,NAMURA KYOKO Graduate School of Engineering Senior Lecturer,BANERJEE, Amit Graduate School of Engineering Professor,HONDA MITSURU	
Target year		Number of credits	1.5	Year/semesters	2023/Second semester
Days and periods	Thu.5	Class style	Lecture	Language of instruction	English
<b>[Overview and purpose of the course]</b>					
Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. Assignment will be done for further understanding of the topics of the course.					
<b>[Course objectives]</b>					
The students understand of each technology towards social issues to be solved by engineers. In addition, the students learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development.					
<b>[Course schedule and contents]</b>					
Topic A: Week 1-4, Water Environment & Nano Technology Topic B: Week 5-8, Light and energy Topic C: -----					
Continue to 現代科学技術特論（12回コース）(2)					

## 現代科学技術特論（12回コース）(2)

Week 9-12, Numerical Simulation

See website for further information. <http://www.glc.t.kyoto-u.ac.jp/class/amst2021>

### [Course requirements]

Each topic consists of four lectures.

This course requests to take all provided three topics.

We may select students who can attend the class before starting the class.

Students who intend to join the course are required to submit the application form through the web site which will be informed in the advance.

See website for further information. <https://www.glc.t.kyoto-u.ac.jp/grad>

### [Evaluation methods and policy]

The average score of the best two assignments for each topics is employed.

For each topic, the students must attend minimum three lectures and submit minimum two assignments evaluated as "passed".

### [Textbooks]

Course materials will be provided.

### [References, etc.]

（ Reference books ）

（ Related URLs ）

<http://www.glc.t.kyoto-u.ac.jp/grad>(The home page of the engineering education research center)

### [Study outside of class (preparation and review)]

This course requests students to prepare a class in advance because some classes will be done by an interactive style.

### （ Other information (office hours, etc.) ）

It is prohibited to change the registered course.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG90 8i061 LE77			
<b>Course title (and course title in English)</b>	先端マテリアルサイエンス通論 (4回コース) Introduction to Advanced Material Science and Technology (4 times course)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Professor,HONDA MITSURU Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The various technologies used in the field of material science serve as bases for so-called high technologies, and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.					
<b>[Course objectives]</b>					
To expand your field of vision for material science and to acquire accomplishments to identify the importance of technologies through the classes for developments in material science.					
<b>[Course schedule and contents]</b>					
Theme A: Material Development Week 1 (4/9) Synthesis of Novel -Conjugated Molecules with Main Group Elements, Tomohiro Higashino Week 2 (4/16) Tumor Imaging and Therapy through Photoirradiation, Koji Miki Week 3 (4/23) Application of Functional Oxides, Kentaro Kaneko Week 4 (5/7) Chemistry of Asymmetric Catalysis #8211 Stereoselective Synthesis of Optically Active Pharmaceutical Compounds #8211, Keisuke Asano					
Theme B: Material Application Week 5 (5/14) Geological disposal of radioactive waste, Taishi Kobayashi Week 6 (5/21) Processing and mechanical properties of structural metallic materials having ultra-fine microstructures, Gao Si Week 7 (5/28) Water Issues under the Climate Change, Kazuaki Yorozu Week 8 (6/4) Particle Technology(TBC), Shuji Matsusaka					
Theme C: Material and Energy Week 9 (6/11) Energy and Resource Recovery from Wastewater, Taira Hidaka Week 10 (6/25) Synthesis, physical properties, and measurement characteristics of mixed anion compounds, Hiroshi Takatsu Week 11 (7/2) Plasma surface interaction 1(TBC), Kuzmin Arseniy Aleksandrovich Week 12 (7/9)Plasma surface interaction 2(TBC), Kuzmin Arseniy Aleksandrovich					
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Continue to 先端マテリアルサイエンス通論 (4回コース) (2)					

## 先端マテリアルサイエンス通論 (4回コース) (2)

### [Course requirements]

Each topic consists of four lectures.

This course requests to choose one topic from provided three topics in advance.

It is prohibited to change the topic after registration.

We may select students who can attend the class before starting the class.

Students who intend to join the course are required to submit the application form through the following web site by 7th of April.

[https://www.t.kyoto-u.ac.jp/fs/kdaigakuin/copy\\_of\\_kyotsu1\\_2021](https://www.t.kyoto-u.ac.jp/fs/kdaigakuin/copy_of_kyotsu1_2021)

### [Evaluation methods and policy]

The average score of the best two assignments is employed.

For the topic which the students chose, they must attend minimum three lectures and submit minimum two assignments evaluated as "passed".

### [Textbooks]

Course materials will be provided.

### [References, etc.]

#### ( Reference books )

Will be informed if necessary.

#### ( Related URLs )

<http://www.glc.t.kyoto-u.ac.jp/grad>(The home page of the engineering education research center)

### [Study outside of class (preparation and review)]

This course requests students to prepare a class in advance because some classes will be done by an interactive style.

### ( Other information (office hours, etc.) )

It is prohibited to change the registered course.

It is prohibited to attend the lectures of the other topics than the students chose.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG90 8i062 LE77			
<b>Course title (and course title in English)</b>	先端マテリアルサイエンス通論 (8回コース) Introduction to Advanced Material Science and Technology (8 times course)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, KOMIYAMA YOSUKE Graduate School of Engineering Professor, HONDA MITSURU Graduate School of Engineering Senior Lecturer, YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer, KANEKO KENTAROU Graduate School of Engineering Senior Lecturer, TAKATSU HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The various technologies used in the field of material science serve as bases for so-called high technologies, and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.					
<b>[Course objectives]</b>					
To expand your field of vision for material science and to acquire accomplishments to identify the importance of technologies through the classes for developments in material science.					
<b>[Course schedule and contents]</b>					
Theme A: Material Development Week 1 (4/9) Synthesis of Novel -Conjugated Molecules with Main Group Elements, Tomohiro Higashino Week 2 (4/16) Tumor Imaging and Therapy through Photoirradiation, Koji Miki Week 3 (4/23) Application of Functional Oxides, Kentaro Kaneko Week 4 (5/7) Chemistry of Asymmetric Catalysis #8211 Stereoselective Synthesis of Optically Active Pharmaceutical Compounds #8211, Keisuke Asano  Theme B: Material Application Week 5 (5/14) Geological disposal of radioactive waste, Taishi Kobayashi Week 6 (5/21) Processing and mechanical properties of structural metallic materials having ultra-fine microstructures, Gao Si Week 7 (5/28) Water Issues under the Climate Change, Kazuaki Yorozu Week 8 (6/4) Particle Technology(TBC), Shuji Matsusaka  Theme C: Material and Energy Week 9 (6/11) Energy and Resource Recovery from Wastewater, Taira Hidaka Week 10 (6/25) Synthesis, physical properties, and measurement characteristics of mixed anion compounds, Hiroshi Takatsu Week 11 (7/2) Plasma surface interaction 1(TBC), Kuzmin Arseniy Aleksandrovich Week 12 (7/9) Plasma surface interaction 2(TBC), Kuzmin Arseniy Aleksandrovich					
----- Continue to 先端マテリアルサイエンス通論 (8回コース) (2) -----					



先端マテリアルサイエンス通論 (8回コース) (2)

**[Course requirements]**

Each topic consists of four lectures.

This course requests to choose one topic from provided three topics in advance.

It is prohibited to change the topic after registration.

We may select students who can attend the class before starting the class.

Students who intend to join the course are required to submit the application form through the following web site by 7th of April.

[https://www.t.kyoto-u.ac.jp/fs/kdaigakuin/copy\\_of\\_kyotsu1\\_2021](https://www.t.kyoto-u.ac.jp/fs/kdaigakuin/copy_of_kyotsu1_2021)

**[Evaluation methods and policy]**

The average score of the best two assignments for each topic is employed.

For each topic which the students chose, they must attend minimum three lectures and submit minimum two assignments evaluated as "passed".

**[Textbooks]**

Not used

Course materials will be provided.

**[References, etc.]**

( Reference books )

( Related URLs )

<http://www.glc.t.kyoto-u.ac.jp/grad>(The home page of the engineering education research center)

**[Study outside of class (preparation and review)]**

This course requests students to prepare a class in advance because some classes will be done by an interactive style.

**( Other information (office hours, etc.) )**

It is prohibited to change the registered course.

It is prohibited to attend the lectures of the other topic than the students chose.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG90 8i063 LE77			
<b>Course title (and course title in English)</b>	先端マテリアルサイエンス通論 (12回コース) Introduction to Advanced Material Science and Technology (12 times course)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, KOMIYAMA YOSUKE Graduate School of Engineering Professor, HONDA MITSURU Graduate School of Engineering Senior Lecturer, YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer, KANEKO KENTAROU Graduate School of Engineering Senior Lecturer, TAKATSU HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The various technologies used in the field of material science serve as bases for so-called high technologies, and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.					
<b>[Course objectives]</b>					
To expand your field of vision for material science and to acquire accomplishments to identify the importance of technologies through the classes for developments in material science.					
<b>[Course schedule and contents]</b>					
Theme A: Material Development Week 1 (4/9) Synthesis of Novel -Conjugated Molecules with Main Group Elements, Tomohiro Higashino Week 2 (4/16) Tumor Imaging and Therapy through Photoirradiation, Koji Miki Week 3 (4/23) Application of Functional Oxides, Kentaro Kaneko Week 4 (5/7) Chemistry of Asymmetric Catalysis #8211 Stereoselective Synthesis of Optically Active Pharmaceutical Compounds #8211, Keisuke Asano					
Theme B: Material Application Week 5 (5/14) Geological disposal of radioactive waste, Taishi Kobayashi Week 6 (5/21) Processing and mechanical properties of structural metallic materials having ultra-fine microstructures, Gao Si Week 7 (5/28) Water Issues under the Climate Change, Kazuaki Yorozu Week 8 (6/4) Particle Technology(TBC), Shuji Matsusaka					
Theme C: Material and Energy Week 9 (6/11) Energy and Resource Recovery from Wastewater, Taira Hidaka Week 10 (6/25) Synthesis, physical properties, and measurement characteristics of mixed anion compounds, Hiroshi Takatsu Week 11 (7/2) Plasma surface interaction 1(TBC), Kuzmin Arseniy Aleksandrovich Week 12 (7/9) Plasma surface interaction 2(TBC), Kuzmin Arseniy Aleksandrovich					
----- Continue to 先端マテリアルサイエンス通論 (12回コース) (2) -----					

先端マテリアルサイエンス通論 (12回コース) (2)

**[Course requirements]**

Each topic consists of four lectures.

This course requests to choose one topic from provided three topics in advance.

It is prohibited to change the topic after registration.

We may select students who can attend the class before starting the class.

Students who intend to join the course are required to submit the application form through the following web site by 7th of April.

[https://www.t.kyoto-u.ac.jp/fs/kdaigakuin/copy\\_of\\_kyotsu1\\_2021](https://www.t.kyoto-u.ac.jp/fs/kdaigakuin/copy_of_kyotsu1_2021)

**[Evaluation methods and policy]**

The average score of the best two assignments for each topics is employed.

For each topic, the students must attend minimum three lectures and submit minimum two assignments evaluated as "passed".

**[Textbooks]**

Not used

Course materials will be provided.

**[References, etc.]**

( Reference books )

( Related URLs )

<http://www.glc.t.kyoto-u.ac.jp/grad>(The home page of the engineering education research center)

**[Study outside of class (preparation and review)]**

This course requests students to prepare a class in advance because some classes will be done by an interactive style.

**( Other information (office hours, etc.) )**

It is prohibited to change the registered course.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 6A019 LJ73 G-ENG02 6A019 LJ73			
<b>Course title (and course title in English)</b>	コンクリート構造工学 Concrete Structural Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKAHASHI YOSHIKAZU Graduate School of Management Professor, YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor, TAKAYA SATOSHI Part-time Lecturer, 中村 健一	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The most common concrete is introduced as a material to be used for infrastructures in various forms. In particular, various structural forms are mentioned, including prestressed concrete. Design, construction, diagnosis, repair, strengthening, and their management in relation to performance based design will be studied.					
<b>[Course objectives]</b>					
Understanding the mechanical properties of concrete and the interaction between concrete and steel material, as well as learning the basic theories of reinforced concrete (RC) structure and prestressed concrete (PC) structure, and also design, construction and maintenance methods.					
<b>[Course schedule and contents]</b>					
Outline (1 time) Outlining the purpose and composition of lectures that focus on the relationship between various concretes and infrastructure structures, as well as the grading method, and so forth					
Reinforced concrete structure (6 times) The mechanical properties of concrete structural materials constituting reinforced concrete structures and the interaction between concrete and steel material are explained, and at the same time, the analysis of the mechanical behavior of reinforced concrete structural parts that are subjected to bending, axial forces, or shearing forces is studied.					
Prestressed concrete structure (6 times) The basic theory of prestressed concrete (PC) structures, PC bridge types, PC bridge installation methods, new structures/new construction methods, bridge type selection methods, PC part design, PC bridge change and repair, recent developments of PC technology, and so forth are explained. In addition, the criteria used in Japan are introduced, and the basics of PC construction and various construction methods/structure forms using prestressing are studied.					
The latest concrete technology (topics) (1 time) The latest topics related to concrete structural engineering are covered and explained.					
Confirmation of learning achievements (1 time) The degree of achievement regarding the contents of this lecture is confirmed.					
Continue to コンクリート構造工学(2)					

## コンクリート構造工学(2)

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### [Course requirements]

Basic knowledge on civil engineering materials science and concrete engineering

### [Evaluation methods and policy]

Reports and presentations will be assigned, and the overall performance for the full term will be judged.

### [Textbooks]

Instructed during class

Others; not specified. Research papers, and so forth will be distributed as necessary.

### [References, etc.]

#### ( Reference books )

Introduced during class

Others; books will be introduced from time to time during the lectures.

### [Study outside of class (preparation and review)]

The contents of civil engineering materials science and concrete engineering should be reviewed.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG02 7A040 LJ73    G-ENG01 7A040 LJ73			
<b>Course title (and course title in English)</b>	流砂水理学 Sediment Hydraulics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, GOTOH HITOSHI Graduate School of Engineering Associate Professor, HARADA EIJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Natural flows in river and coast are movable bed phenomena with the interaction of flow and sediment. At a river and a coast, a current and a wave activate a sediment transport and bring the topographical change of a bed such as sedimentation or erosion. This lecture provides an outline about the basics of sediment (or movable bed) hydraulics, and detail of the computational mechanics of sediment transport, which has been developed on the basis of dynamics of flow and sediment by introducing a multiphase flow model and a granular material model. Furthermore, about sediment and water-environment relationship, some of frontier technologies, such as an artificial flood, removal works of dam sedimentation, coastal protection works, and sand upwelling work for covering contaminated sludge on flow bottom etc., are mentioned.					
<b>[Course objectives]</b>					
Students understand the basics of sediment hydraulics and outline of advanced models for computational sediment hydraulics, such as multiphase flow model and granular material model. Students understand the present conditions of sediment control works.					
<b>[Course schedule and contents]</b>					
Introduction, 1 time, The purpose and constitution of the lecture, the method of the scholastic evaluation are explained.					
Basics of sediment hydraulics, 5 times, Physical characteristic of a movable bed and a non-equilibrium sediment transport process and its description are explained. Furthermore, the prediction technique of topographical change due to current and waves is outlined.					
Computational mechanics of sediment transport: The state of the art, 8 times, Essential parts of numerical models of the movable bed phenomena, which has been developed by introducing dynamic models such as a granular material model to describe a collision of sediment particles and a multiphase flow model to describe a fluid-sediment interaction, are described. In comparison with the conventional movable bed computation, the points on which has been improved to enhance the applicability of the models are concretely mentioned. Some frontier studies of sediment transport mechanics are also introduced.					
Achievement confirmation, 1 time, Comprehension check of course contents.					
Continue to 流砂水理学(2)					

## 流砂水理学(2)

### [Course requirements]

Undergraduate-level Hydraulics or Hydrodynamics is required. Because a commentary easy as possible is kept in mind by lectures, students without these prerequisite are welcomed.

### [Evaluation methods and policy]

Grading is based on report activities in lectures and written examination.

### [Textbooks]

Hitoshi Gotoh: Computational Mechanics of Sediment Transport, Morikita Shuppan Co., Ltd., p.223, 2004 (in Japanese).

### [References, etc.]

#### ( Reference books )

Non

#### ( Related URLs )

(Non)

### [Study outside of class (preparation and review)]

Review fundamental items of hydraulics or hydrodynamics.

### ( Other information (office hours, etc.) )

Non

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 5A055 LB73 G-ENG02 5A055 LB73				
<b>Course title (and course title in English)</b>	環境地盤工学 Environmental Geotechnics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Global Environmental Studies Professor, KATSUMI TAKESHI Graduate School of Global Environmental Studies Associate Professor, TAKAI ATSUSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Several issues on environmental geotechnics including geoenvironmental contamination and countermeasure, waste containment and reuse are introduced to understand the contribution of geotechnical engineering to global and local environmental issues. Geoenvironmental issues due to the 2011 East Japan Earthquake and Tsunami are also introduced.					
<b>[Course objectives]</b>					
Students should understand the geotechnics to solve the following geoenvironmental issues; soil and groundwater contamination, waste disposal and waste utilization, and extend this knowledge to the development of concepts and technologies for creating and preserving the geo-environment.					
<b>[Course schedule and contents]</b>					
Introduction, 1 time, Introduction to Environmental Geotechnics, including goals, outline and grading policy of the course Waste geotechnics, 3-4 times, Functions and structures of waste containment facilities Geotechnics on the liner system (Geosynthetics, clay liner, Leachate collection layer) Post-closure utilization of waste landfill Remediation geotechnics, 3-4 times, Behaviors of contaminants in subsurface Mechanisms of soil and groundwater contamination Remediation of soil and groundwater contamination Case histories Geo-environmental issues related to construction works, global environmental issues, and natural disasters, 2-3 times, Mechanisms and remediation of geoenvironmental problems and geo-disasters caused by construction works Geoenvironmental issues caused by the 2011 East Japan Earthquake and Tsunami Reuse of wastes in geotechnical applications, 3-4 times, Engineering properties of recycled materials in geotechnical applications (Incineration ashes, coal ash, surplus soils, dredged soils) Geoenvironmental impact assessment and control of waste utilization Case histories Presentation and discussion, 2-3 times, Student presentation, discussion, and summary on above topics					
<b>[Course requirements]</b>					
Having knowledge on soil mechanics and geotechnical engineering at bachelor level is preferable, but not requirement.					
<b>[Evaluation methods and policy]</b>					
Continuous assessment including attendance, some assignments, and final report					
<b>[Textbooks]</b>					
Not specified. Several technical papers related to the course will be distributed.					
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Continue to 環境地盤工学(2)					



## 環境地盤工学(2)

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### [References, etc.]

#### ( Reference books )

Geoenvironmental Engineering (Kyoritsu Shuppan Publishing, ISBN: 9784320074293) Handbook of Geoenvironmental Engineering (Asakura Publishing, ISBN: 9784254261523) Introduction to Environmental Geotechnics (Japanese Geotechnical Society, ISBN: 9784886444196)

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 5A216 LE73   G-ENG02 5A216 LE73			
<b>Course title (and course title in English)</b>	水文学 Hydrology		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Professor,ICHIKAWA YUTAKA Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Physical mechanisms of the hydrologic cycle are described from the engineering viewpoint. The rainfall-runoff modeling and its prediction method are emphasized. Physical hydrological processes explored are surface flow, saturated-unsaturated subsurface flow, streamflow routing, and evapotranspiration. Physical mechanism of each hydrological process and its numerical modeling method are explained. The basic equations and numerical simulation methods are provided. Then, detail of distributed hydrological modeling is explained through exercise.					
<b>[Course objectives]</b>					
The goals of the class are to understand the physical mechanism of hydrological processes, their basic equations, and numerical simulation methods.					
<b>[Course schedule and contents]</b>					
<p>Introduction,1time,The hydrologic cycle and the hydrological processes are explained.</p> <p>Surfaceflow,2times,The physical process of the surface flow and its numerical modeling method are described. The basic equations of the surface flow and the numerical simulation methods are explained.</p> <p>Streamflow routing,2times,The physical process of the streamflow routing and its numerical modeling method are described. The basic equations of the streamflow routing and the numerical simulation methods are explained.</p> <p>Channel network and watershed modeling,1time,Numerical representations of channel networks and catchments are explained.</p> <p>Distributed hydrological model,5times,A physically-based distributed hydrological model is described, which is constructed with numerical representations of channel networks and catchments.</p> <p>Climate change and hydrologic cycle,1time,Data analysis of the latest GCM simulation is presented and the impact of climate change on the hydrologic cycle is discussed.</p> <p>Evapotranspiration,2times,The physical process of the evapotranspiration and its numerical modeling method are described. The basic equations of the evapotranspiration and the numerical simulation methods are explained.</p> <p>Feedback of study achievement,1time,Feedback of study achievement is conducted.</p>					
<b>[Course requirements]</b>					
Basic knowledge of hydraulics and hydrology					
Continue to 水文学(2)					

## 水文学(2)

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### [Evaluation methods and policy]

Examination and report

### [Textbooks]

Handouts are distributed at each class.

### [References, etc.]

( Reference books )

( Related URLs )

(<http://hywr.kuciv.kyoto-u.ac.jp/lecture/lecture.html>)

### [Study outside of class (preparation and review)]

Read the textbook and/or related documents in advance and work on assignments to improve understanding of the lecture contents.

### ( Other information (office hours, etc.) )

This course is open in English every other year. The course will be open in AY2018.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 6A402 LJ77 G-ENG02 6A402 LJ77			
<b>Course title (and course title in English)</b>	資源開発システム工学 Resources Development Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, MURATA SUMIHIKO Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Development of mineral resources and energy resources is essential to the sustainable development of our society. In this class, the exploration and development process of natural resources are reviewed including the environmental conservation and harmony. First, fundamentals of reservoir engineering for oil and natural gas are lectured. Second, methods and techniques used to reduce environmental loads in modern resources development are reviewed and their theoretical backgrounds are lectured. Fundamentals of geochemical modeling, that is applicable to simulate hydrogeochemical processes in mine drainage treatment, is also introduced.					
<b>[Course objectives]</b>					
The goal of this class is to understand the natural resources development concerning environment and master the reservoir engineering needed for the exploration and development of oil and natural gas resources. In addition, followings are also a goal of this class. Students understand flow of resources development, and methods and techniques that are used to reduce environmental loads therein. Students understand and come to be able to explain theoretical backgrounds of the techniques that are utilized to reduce environmental loads in resources development. Students can conduct basic geochemical modeling.					
<b>[Course schedule and contents]</b>					
1st: From exploration to development & production for mineral and energy resources The engineering flow from exploration to development & production of mineral and energy resources indispensable for the sustainable development of human society is lectured. Environmental conservation and environmental harmony in resources development are also included.					
2nd: Basic concept of reservoir engineering The basic concepts of reservoir engineering, such as the basic properties of reservoir rock and reservoir fluids, reservoir pressure, and oil and gas recovery, are explained.					
3rd: Basic equation of radial flow (Part 1) The basic equation of the radial flow of a reservoir fluid to a well is derived, and Inflow equations for the semi-steady state and steady-state conditions are described.					
4th: Basic equations of radial flow (Part 2) Constant Terminal Rate Solution, which is the solution of the basic equation of radial flow of oil to a well					
----- Continue to 資源開発システム工学(2)					

## 資源開発システム工学(2)

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when the oil is produced at a constant production rate and gives the change of bottom hole pressure with time, is derived.

### 5th: Oil well testing (Part 1)

The basic concept of oil well testing and analysis methods for the pressure drawdown and buildup tests are explained. In addition, the theory of Matthew, Brons, and Hazebroke is explained, and then the evaluation methods of average reservoir pressure (MBH method and Dietz method) are explained.

### 6th: Oil well testing (Part 2)

The analysis method for the multi-rate pressure drawdown test is explained. The effects of partial completion and after-flow are also explained.

### 7th: Gas well testing (Part 1)

The basic concept of gas well testing and the equations used for the analysis are explained.

### 8th: Gas well testing (Part 2)

The analysis methods for the gas well testing are explained.

### 9th: Basic theory of immiscible displacement in the reservoir (Part 1)

Fractional flow theory and Buckley-Leverett equation for the one-dimensional displacement of oil by water are explained, and Welge's method for evaluating oil recovery is explained.

### 10th: Basic theory of immiscible displacement in the reservoir (Part 2)

The oil displacement by water under the conditions of segregated flow and allowance for the effect of a finite capillary transition zone is explained. The method to evaluate oil recovery under these conditions is also explained based on the fractional flow theory.

### 11th: Basic theory of immiscible displacement in the reservoir (Part 3)

The oil displacement by water under the stratified reservoir condition is explained. The method to evaluate oil recovery under this condition is also explained based on the fractional flow theory.

### 12th: Enhanced oil recovery

Various enhanced oil recovery methods such as chemical, miscible gas, and thermal flooding are explained.

### 13th: Resources development and environmental loads

Flow of resources development and their impacts on surrounding environments are reviewed, referring to actual examples of mine pollution. Methods and techniques that are used to reduce environmental loads are introduced.

### 14th: Theoretical backgrounds of the techniques to reduce environmental loads

Fundamental theories and principles relevant to treatment of hazardous substances (e.g., mine drainage) generated through resources development are lectured.

### 15th: Fundamentals of geochemical modeling

Basics of geochemical modeling are lectured. Practical training, in which treatment of mine drainage is assumed, is conducted using representative geochemical modeling code, phreeqc.

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Continue to 資源開発システム工学(3)

## 資源開発システム工学(3)

### [Course requirements]

It is desirable to have knowledge of calculus of undergraduate level.

### [Evaluation methods and policy]

Evaluation is made by the average score of report problems. They are presented 2 or 3 times in the semester.

### [Textbooks]

Not used

Handouts are delivered.

### [References, etc.]

#### ( Reference books )

L. P. Dake 『Fundamentals of Reservoir Engineering, 19th impression』 ( Elsevier ) ISBN:9780444418302  
( in English )

#### ( Related URLs )

(Web page of this class is not provided. Information is shown in the class when it is needed.)

### [Study outside of class (preparation and review)]

Self study is required using supplemental book.

### ( Other information (office hours, etc.) )

Office hours are set 10:30-12:00 and 14:30-16:00 on the same day of the class.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 6A405 LJ77			
<b>Course title (and course title in English)</b>	地殻環境工学 Environmental Geosphere Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI 東京大学地震研究所 教授 KINOSHITA MASATAKA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Earth's crust environment engineering is an academic field closely related to our lives, and it covers many problems related to Earth science and engineering, such as the underground development and use of infrastructure facilities, the geological disposal of radioactive waste, underground storage of gas and liquid, natural disasters including landslides and earthquakes, as well as the exploration, development, and resource quantity evaluation of groundwater resources, metal/non-metal mineral resources, and geothermal and energy resources. This lecture covers topics that are important in Earth's crust environment engineering and their basic concepts, engineering applications, and the spatial information approach to clarify the geological, physical, and chemical properties of the Earth ' s crust, while introducing research examples.					
<b>[Course objectives]</b>					
Thoroughly understand the positioning of the Earth ' s crust as an element of the Earth, the physical and chemical properties, its importance as a resource germination place that benefits humanity, and the source of natural disaster threats that is contradictory to this. Along with that, finding out one's own direction in the relationship with the Earth ' s crust, which can contribute to the welfare of humanity and a sustainable society; in other words, development and use methods of the Earth ' s crust and environmental conservation laws.					
<b>[Course schedule and contents]</b>					
1. Introduction and fundamentals of water cycles (1 time) In addition to explaining the program of this class, global environmental issues will be summarized as the starting point of this class. As examples of material circulation on a global scale, especially taking water environment issues into account that have recently attracted attention, the mechanism of the water cycle, the physical and geological factors that govern water flow, and so forth will be explained, and understanding of the importance of the Earth ' s crust will be gained. [Koike]					
2. Chemistry of the Earth System (2 times) Since Earth ' s crust environment engineering is an academic field targeting the Earth, it is first necessary to understand the structure, physics, and chemistry of the Earth. For that purpose, there will be a review on general geology and minerals, and the chemical properties of the rock minerals forming the Earth ' s crust, mantle, core, the chemical composition of the crustal fluid, and the chemical reaction of rocks and fluids and so forth will be discussed. Additionally, the function of microorganisms on the Earth ' s crust chemistry will be explained. [Koike]					
3. Physics of the Earth system (2 times)					
----- <b>Continue to 地殻環境工学(2)</b>					

## 地殻環境工学(2)

The materials and pressure and thermal structures of the Earth will be reviewed, and the dynamics of the Earth including crustal deformation will be explained. [Hayashi and Kinoshita]

### 4. Foundations of Geoinformatics (1) (Geological modeling method) (2 times)

The spatial informatics approach to clarify in detail the physical and chemical properties of the Earth ' s crust and its distribution over time-space will be explained in series. First, as a method for modeling geological structure and physical properties from discretely distributed geological information, an overview will be given on mathematical geology, the general analytical method of geological data, and spatial correlation structure analysis by variogram. Next, a lecture will be given on spatial data estimation by kriging, geostatistical simulation, and the application of a neural network, which is a form of deep learning, will be provided along with a study example. [Koike]

### 5. Foundations of Geoinformatics (2) (Scaling of geological structure) (1 time)

Although what is underground cannot be seen directly, information on geology, geometric structure, crustal deformation, crustal chemistry, and so forth may appear in the topography. As a method for estimating the deep environment of the Earth ' s crust surface, a lecture will be given on the utilization of topographical and geological information, as well as estimating the local structure from limited information to wide scale, or the scaling of geological structure (what connects micro and macro, etc.). [Koike]

### 6. Fundamentals of Geoinformatics (3) (Remote sensing) (2 times)

An outline of remote sensing which is effective as a survey method concerning the physics/chemistry of geological crust, geological structure, variation, resource exploration, and environmental monitoring will be given. First, a lecture will be given on the interaction of materials and electromagnetic waves, and remote sensing by optical sensors, with research and survey examples. Next, the basics of remote sensing by microwave sensor, the identification of surface material by polarimetric SAR, topographic analysis by interference SAR, and crustal deformation analysis will be explained. [Koike]

### 7. Geochemical exploration (1 time)

The geochemical exploration method for extracting and analyzing chemical anomalies in the shallow part of the surface will be outlined. [Kashiwaya]

### 8. Geosphere environmental and resource problems (3 times)

There are cases where the Earth ' s crust is used as a long-term storage location. The geological disposal of high-level radioactive waste, which is representative, and an underground reservoir of carbon dioxide will be described. In addition, the deep crustal fluid and water-rock interactions, which is important for the thermal structure of the Earth, and the formation of mineral, oil, and gas deposits will be explained. [Kashiwaya]

### Feedback (1 time)

There will be a supplementary explanation, through classes, individual consultations, and so forth about the parts where students may have insufficient understanding of the lecture contents described above, based on the evaluation of reports.

## [Course requirements]

It is desirable that students have basic knowledge of geology, physics, and chemistry.

Continue to 地殻環境工学(3)



## 地殻環境工学(3)

### [Evaluation methods and policy]

The grades will be evaluated by combining the report and points given for participation in class. The points given for participation in class will be evaluated based on attendance status, confirmation of comprehension level by quizzes, and so forth during class. The ratio between report and participation points is about 9:1.

### [Textbooks]

Handouts will be distributed during each class.

### [References, etc.]

#### ( Reference books )

References will be introduced in the handouts.

### [Study outside of class (preparation and review)]

Reports will be assigned about three or four times in order to review the contents of the class. The aim is to deepen understanding by solving problems.

### ( Other information (office hours, etc.) )

Office hours are not particularly set, but questions are accepted from time to time.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 5A420 LE77				
<b>Course title (and course title in English)</b>	探査工学特論 Exploration Geophysics, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MIKADA HITOSHI Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,XU Shibo	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Applied geophysical exploration technologies in disaster mitigation, civil engineering, and earth resources engineering is discussed in terms of seismological and of electromagnetic theories. Students may be asked to process data or design digital filters in the course.					
<b>[Course objectives]</b>					
Understanding seismicological and electromagnetic theories used in geophysical exploration and subsurface-imaging technologies.					
<b>[Course schedule and contents]</b>					
Electromagnetic signal processing, 3 times, Principles of magnetotelluric methods, electromagnetic sources and noise reduction. Modeling technologies in electromagnetic methods,3 times, Subsurface structure modeling in EM methods. The effects of surface weathered layers, the identification of spatial dimensions, and modeling methodologies are discussed. Signal processing in seismics,4 times,Digital filtering in seismic data processing. Reflection seismology,3 times,Fundamental theories of reflection seismic data processing. Seismic migration is the one to be briefly discussed. Petrophysics,2 times,Fundamental petrophysics, and fundamental measurement theories in geophysical logging are discussed.					
<b>[Course requirements]</b>					
The credits of Exploration Geophysics in undergraduate course and Fundamental Theories of Geophysical Exploration in graduate course are requested to obtain before the classes.					
<b>[Evaluation methods and policy]</b>					
Brief explanations on the grading will be given at the time of the lecture.					
<b>[Textbooks]</b>					
Specified in the course.					
<div style="text-align: right;">Continue to 探査工学特論(2)</div>					

## 探査工学特論(2)

### [References, etc.]

#### ( Reference books )

J.F.Claerbout, 1976, Fundamentals of Geophysical Data Processing, (OOP:photocopies to be specified)

#### ( Related URLs )

(Would be specified by the lecturers.)

### [Study outside of class (preparation and review)]

Specified in the course.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 6A805 LJ73 G-ENG02 6A805 LJ73			
<b>Course title (and course title in English)</b>	リモートセンシングと地理情報システム Remote Sensing and Geographic Information Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, UNO NOBUHIRO Graduate School of Engineering Professor, SUSAKI JUNICHI Graduate School of Engineering Assistant Professor, KIMURA YUUSUKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Geoinformatics is the science and technologies dealing with spatially distributed data acquired with remote sensing, digital photogrammetry, global positioning system, etc, to address the problems in natural phenomena or human activities. This course particularly focuses on remote sensing by using LiDAR and geographic information system (GIS) and explains the theory and applications. Unlike traditional surveying, LiDAR technique can sequentially obtain the data in a wide area within a short time, and thus it is now widely used in construction and management of civil infrastructure. GIS is a technique to handle digital maps and related information, and it is popular in the fields of urban planning, environmental management and infrastructure management. This course provides an understanding of remote sensing and GIS via applications presented by the exercises of remote sensing and lectures of GIS.					
<b>[Course objectives]</b>					
Students understand the basic theory and acquire the basic techniques of remote sensing for observation and analysis of environmental changes, disaster effects and human activities in urban areas. And, they understand the basic theory and applications of GIS.					
<b>[Course schedule and contents]</b>					
(1) Introduction & Coordinate system and map projection, 1 slot, Introduction to remote sensing and GIS is given. Principal coordinate systems and map projection methods used for satellite image and GIS data are explained.					
(2) Radiation and reflection of electromagnetic waves, and optical sensor, 1 slot, Basic terms on electromagnetic radiation including radiation and reflection are introduced, and calculation of surface reflectance and temperature is explained. In addition, principles and applications of visible and infrared sensors are introduced.					
(3) Property of SAR, 1 slot, Concept of synthetic aperture radar (SAR) is first introduced, and the image processing, statistical property, speckle filtering and polarimetric SAR are explained.					
(4) Measurement of topography using SAR data, 1 slot, Theory of Interferometric SAR (InSAR) and differential InSAR (DInSAR) is introduced. Then, long-term monitoring of land deformation by using multi-temporal SAR images is explained.					
(5&6) Measurement of topography using photogrammetry, 2 slot, Generation of DSM by using photogrammetry is explained.					
(7) Introduction to GIS, 1 slot, Structure of GIS (Geographic Information System) and its utilization for					
----- Continue to リモートセンシングと地理情報システム(2) -----					

## リモートセンシングと地理情報システム(2)

spatial analysis are outlined.

(8) GIS and Network Analysis, 1 slot, Basic idea of network structure, evaluation indices and methods of network analysis are explained.

(9) GIS and Spatial Correlation Analysis, 1 slot, Focusing on spatial correlation analysis useful for developing spatial model, regression analysis and spatial auto correlation analysis are explained.

(10) Classification Method of Spatial Attribute, 1 slot, Classification method of spatial attribute is explained in order to classify the target area using attribute information in GIS.

(11) Transportation Big Data Collected by Mobile Objects Observation and Its Utilization, 1 slot, The changes in transportation observation led by progress of location identification technologies is stated. In addition, utilizations and issues of big data in transportation are explained.

(12) Realization of Smart City and Big Data Utilization, 1 slot, The concept of Smart City and corresponding projects are introduced, and utilizations and issues of big data for smart city are explained.

(13&14) Open Data and GIS, 2 slot, The concept of open data and the domestic and overseas activities about it are explained. The GIS software that can use the open data is introduced and the analysis using the open data is explained.

(15) Assessment of understanding, 1 slot, Assess students' understanding levels

### [Course requirements]

None

### [Evaluation methods and policy]

Grading is based on the achievements in exercise and assignments. Mid-term exam related to the topics from No.1 to 6 may be assigned.

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

- Junichi Susaki and Michinori Hatayama, Geoinformatics, Corona Publisher, 2013 - W. G. Rees , Physical Principles of Remote Sensing 3rd ed., Cambridge University Press, 2013. - J. A. Richards and X. Jia , Remote Sensing Digital Image Analysis: An Introduction, 5th ed., Springer-Verlag, 2013. -M. Netler and H. Mitsova, Open Source GIS: A GRASS GIS Approach 3rd ed., The International Series in Engineering and Computer Science, 2008.

# リモートセンシングと地理情報システム(3)

## ( Related URLs )

(<http://www.gi.ce.t.kyoto-u.ac.jp/user/susaki/rsgis/index.html>)

## [Study outside of class (preparation and review)]

Nothing

## ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG02 6A808 LJ73    G-ENG01 6A808 LJ73			
<b>Course title (and course title in English)</b>	景観デザイン論 Civic and Landscape Design		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Global Environmental Studies Professor, KAWASAKI MASASHI Graduate School of Global Environmental Studies Associate Professor, YAMAGUCHI KEITA  Part-time Lecturer, YAGI HIROKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The lecture will discuss landscape design theory that comprehensively encompasses the evaluation and elucidation of wide-area landscapes, people's environmental awareness and cultural activities, and how to organize spaces based on a close relationship with them; civic design in public spaces such as streets and parks, waterfront; landscape design of green systems and water systems; designing communication to encourage community power.					
<b>[Course objectives]</b>					
Enhancing the ability to design landscapes based on the understanding of the basic structure of public spaces and landscapes.					
<b>[Course schedule and contents]</b>					
Guidance. Landscape and image, 1 time, Guidance, Lecture on landscape and image. Architectural Design of city and urban facilities, 3 times, Lecture on planning and designing about landscape design of urban facilities such as roads and plazas, parks, waterfront and waterfront and public space. Landscape Design and Management, 4 times, [Theory] Reading landscape, landscape evaluation methods, [History] History of the concept of landscape, landscape design, landscape policies, [Practice] Society in the region, the case and method of community development, communicative space design. Presentation and discussion of assignments by students.  Landscape Architecture Practice, 6 times, Design of streets, parks, etc. (Explanations of assignments (1 time), site analysis (1 time), draft critique (3 time), presentation and critique (1 time)  Feedback, 1 time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Reports (Kawasaki: 50%) and design practice (50%)					
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Continue to 景観デザイン論(2)					

## 景観デザイン論(2)

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

It is recommended to visit the places and landscape objects introduced in this lecture as much as possible to verify the ways of the landscape evaluation by your own eyes, maps, and literature.

### ( Other information (office hours, etc.) )

Questions will be accepted after the class, by visiting the laboratory at Katsura Campus (Kawasaki: Room 202, Building C1-1; Yamaguchi: Room 201, Building C1-1, both Katsura Campus), or by e-mail.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG01 5F003 LJ73 G-ENG02 5F003 LJ73				
<b>Course title (and course title in English)</b>	連続体力学 Continuum Mechanics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SUGIURA KUNITOMO Graduate School of Engineering Professor, YAGI TOMOMI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Continuum mechanics is a unified basis for solid mechanics and fluid mechanics. The aims of this course are to introduce the continuum mechanics from their basics to the some forms of constitutive law and also to provide students with mathematical way of understanding the continuum mechanics. This course contains the fundamentals of vector and tensor calculus, the basic equations of continuum mechanics, the tensor expressions of elastic problems and further applications.					
<b>[Course objectives]</b>					
Fundamental theorems on structural mechanics and design will be learned, and ability to judge the proprieties of each computational structural analysis will be acquired.					
<b>[Course schedule and contents]</b>					
<p>Introductions, 1time, Yagi</p> <ul style="list-style-type: none"> <li>- Outline of Structural Analysis</li> <li>- Mathematical Preliminaries (Vectors and Tensors)</li> </ul> <p>Matrices and tensors, 1time, Yagi</p> <ul style="list-style-type: none"> <li>- Summation Convention</li> <li>- Eigenvalues and Eigenvectors</li> </ul> <p>Differential and integral calculus of tensors, 1time, Yagi</p> <ul style="list-style-type: none"> <li>- Quotient Laws</li> <li>- Divergence Theorem</li> </ul> <p>Kinematics, 1time, Yagi</p> <ul style="list-style-type: none"> <li>- Material Description</li> <li>- Spatial Description</li> <li>- Material derivative</li> </ul> <p>Deformation and strain, 1times, Yagi</p> <ul style="list-style-type: none"> <li>- Strain tensors</li> <li>- Compatibility conditions</li> </ul> <p>Stress and equilibrium equation, 1time, Yagi</p> <ul style="list-style-type: none"> <li>- Stress Tensors</li> <li>- Equilibrium Equations</li> </ul>					
Continue to 連続体力学(2)					

## 連続体力学(2)

Conservation law and governing equation, 1time, Yagi

- Conservation of Mass
- Conservation of Linear Momentum
- Conservation of Energy

Constitutive equation of idealized material, 1time, Sugiura

- Perfect Fluid
- Linear Elastic Material(Isotropic)

Elastic-plastic behavior and constitutive equation of construction materials, 1time, Sugiura

- Yield Criteria
- Flow Rule
- Hardening Rule

Boundary value problem, 1time, Sugiura

- Governing Equations and Unknowns
- Navier-Stokes Equation
- Navier Equation

Variational principle, 2time, Sugiura

- Principle of Virtual Work
- Principle of Complementary Virtual Work

Various kinds of numerical analyses, 2times, Sugiura

- Weighted Residual Method
- Finite Element Method

Confirmation of the attainment level of learning, 1time, All

Feedback based on the Final Examination

### [Course requirements]

Basic knowledge for structural mechanics, soil mechanics and fluid mechanics are required.

### [Evaluation methods and policy]

Assessment will be based on exam, report and participation.

### [Textbooks]

Handouts are given

### [References, etc.]

( Reference books )

not specified

Continue to 連続体力学(3)

連続体力学(3)

**[Study outside of class (preparation and review)]**

As appropriate, the assignments are given based on the content of Lecture.

**( Other information (office hours, etc.) )**

upon request

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 6F009 LE73 G-ENG02 6F009 LE73				
<b>Course title (and course title in English)</b>	構造デザイン Structural Design		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKAHASHI YOSHIKAZU Graduate School of Engineering Associate Professor, KITANE YASUO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>This course provides the knowledge of the structural planning and design for civil infrastructures. Fundamentals of the reliability of structures based on the probability and statistics are given. Emphasis is placed on the reliability index and the calibration of partial safety factors in the LRFD design format. Furthermore, the relationship between structure and form is discussed with various examples.</p>					
<b>[Course objectives]</b>					
<p>To understand the structural planning and design for civil infrastructures. To understand the reliability-based design of structures. To deepen the understanding of the relationship between structure and form.</p>					
<b>[Course schedule and contents]</b>					
<p>Structural Planning, 2 times, Structural Planning of civil infrastructures is introduced. The concept, significance of planning, characteristics of civil infrastructures are discussed. Practical planning process of a bridge is explained.</p> <p>Structure and Form, 3 times, The bridge types such as girder, truss, arch and suspension bridge that have been regarded individually are explained as an integrated concept from the viewpoint of acting forces to understand the structural systems which have continuous or symmetrical relationships. Furthermore, various examples are discussed based on the understanding of the structural systems.</p> <p>Structural Design and Performance-based Design, 3 times, Design theory of civil infrastructures is introduced. The allowable stress design method and the limit state design method are explained. The basic of earthquake resistant design is discussed based on the dynamic response of structures. Performance-based design is also introduced.</p> <p>Random Variables and Functions of Random Variables, 1 time, Fundamentals of random variables, functions of random variables, probability of failure and reliability index in their simplest forms are lectured.</p> <p>Structural Safety Analysis, 3 times, Limit states, probability of failure, FOSM reliability index, Hasofer-Lind reliability index, Monte Carlo method are lectured.</p> <p>Design Codes, 2 times, Code format as Load and Resistance Factors Design (LRFD) method, calibration of partial safety factors based on the reliability method are given.</p> <p>Assessment of the Level of Attainment, 1 time, Assess the level of attainment.</p>					
<b>[Course requirements]</b>					
Fundamental knowledge on Probability and Statistics, and Structural Mechanics					
Continue to 構造デザイン(2)					

## 構造デザイン(2)

### [Evaluation methods and policy]

Assessed by term-end examination (90%), plus homework assignments (10%)

### [Textbooks]

Reliability of Structures, A. S. Nowak and K. R. Collins, McGraw-Hill, 2000

### [References, etc.]

#### ( Reference books )

U.Baus, M.Schleich, Footbridges, Birkhauser, 2008 ( Japanese ver.: Footbridges(translated by Kubota, et al.), 鹿島出版会, 2011 ) 久保田善明, 『橋のディテール図鑑』, 鹿島出版会, 2010 Other books will be given in the lectures as necessary.

### [Study outside of class (preparation and review)]

N/A

### ( Other information (office hours, etc.) )

Structural planning and design will be given by Y. Takahashi, and Structural reliability analysis by M. Matsumura.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG02 6F010 LE73    G-ENG01 6F010 LE73			
<b>Course title (and course title in English)</b>	橋梁工学 Bridge Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,YAGI TOMOMI Graduate School of Engineering Associate Professor,KITANE YASUO Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The subject matter of bridge engineering can be divided into two main parts, which are steel structure and wind loading/wind resistant structure. The aim of this course is to provide details of mechanical behaviors, maintenance and design of bridge structures. The former part of this course contains the static instability of steel structures and the problems of corrosion、fatigue、brittleness、weldability on steel bridges. In the latter part, the basics of wind engineering, bridge aerodynamics and wind-resistant design including current problems to be solved are provided are provided.					
<b>[Course objectives]</b>					
Also, the basic knowledge for wind engineering and aerodynamic instabilities, which are necessary for the wind resistant design of bridges, will be acquired.					
<b>[Course schedule and contents]</b>					
<p>Introduction(1, Sugiura)</p> <ul style="list-style-type: none"> <li>- Fundamental knowledge on steel structures</li> <li>- Types of steel structures</li> <li>- Future trend of steel structures</li> <li>- Stress-strain relationship</li> <li>- High performance steels</li> </ul> <p>Failures of Steel Structures(1, Kitane)</p> <p>Fabrication and Erection of Steel Structures(1, Sugiura)</p> <ul style="list-style-type: none"> <li>- Initial imperfections</li> <li>- Construction of steel structures</li> <li>- Residual stresses and initial deformations</li> <li>- Joints(welded and bolted)</li> </ul> <p>Fatigue fracture, fatigue life and fatigue design(1, Kitane)</p> <ul style="list-style-type: none"> <li>- S-N design curve</li> <li>- Fatigue crack growth, stress intensity factor</li> <li>- Miner's rule on damage accumulation</li> <li>- Repair of fatigue damage</li> </ul> <p>Structural stability and design for buckling(1, Kitane)</p>					
Continue to 橋梁工学(2)					

## 橋梁工学(2)

- Structural instability and accident
- Theory of Stability
- Compressive members, etc.

### Corrosion and anti-corrosion of steel structures(1, Sugiura)

- Mechanism of corrosion
- Micro- and Macro- cells
- Anti-corrosion
- Life-cycle costs

### Wind resistant design of structures(2, Yagi)

- Natural winds due to Typhoon, Tornado and so on
- Evaluation and estimation of strong winds
- Wind resistant design methods
- Various kinds of design codes

### Aerodynamic instabilities of structures(3, Yagi)

- Introduction of aerodynamic instabilities (ex. vortex-induced vibration, galloping, flutter, buffeting, cable vibrations)
- Mechanisms of aerodynamic instabilities
- Evaluation methods and Countermeasures

### Computational Fluid Dynamics(2, Noughi)

- Fundamentals of CFD
- Application to bridge aerodynamics

### Topics(1, Sugiura & Kitane)

- Introduction of current topics on bridge engineering by a visiting lecturer

### Confirmation of the attainment level of learning(1, All)

Confirm the attainment level of learning

## [Course requirements]

Basic knowledge for construction materials, structural mechanics and fluid mechanics are required.

## [Evaluation methods and policy]

Assessment will be based on exam, reports and participation.

## [Textbooks]

Handouts are given

## [References, etc.]

### ( Reference books )

not specified

Continue to 橋梁工学(3)

橋梁工学(3)

[Study outside of class (preparation and review)]

work on assignment

( Other information (office hours, etc.) )

upon request

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>		G-ENG01 6F011 LE73    G-ENG02 6F011 LE73			
<b>Course title (and course title in English)</b>	数值流体力学 Computational Fluid Dynamics		<b>Instructor's name, job title, and department of affiliation</b>	Academic Center for Computing and Media Studies Professor, USHIJIMA SATORU Graduate School of Engineering Professor, GOTOH HITOSHI Graduate School of Engineering Associate Professor, KHAYYER ABBAS Academic Center for Computing and Media Studies Assistant Professor, TORIU DAISUKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Computational Fluid Dynamics (CFD) is largely developed with the progress of computer technology in recent years. CFD is powerful and effective to predict the various fluid phenomena, which show the complicated behaviors due to the non-linearity and multi-physics interactions. This course provides the governing equations for compressible and incompressible fluids as well as the discretization and numerical procedures, such as finite difference, finite volume and particle methods.					
<b>[Course objectives]</b>					
Course goal is to understand the basic theory and numerical procedures about CFD.					
<b>[Course schedule and contents]</b>					
<p>(1) Computational method with FDM and FVM [7 times] :</p> <p>The governing equations are firstly derived for compressible fluids and then they are transformed to incompressible ones on the basis of continuum mechanics and classical laws. The course introduces the MAC algorithm, which is generally used to solve the governing equations of incompressible fluids discretized with the finite difference and finite volume methods (FDM and FVM). The numerical procedures are also discussed for parabolic, hyperbolic and elliptic partial differential equations, in terms of the numerical stability and accuracy, when we use the explicit and implicit discretization methods. In addition, some important topics will be introduced, such as the grid system, the combination of implicit discretization and higher-order schemes, and a method to solve the pressure-velocity field accurately etc. Some recent numerical algorithms for low-Mach-number compressible flows will also be introduced with some computational examples. Homework will be assigned almost every week.</p> <p>(2) Particle method - basic theory and improvements [7 times] :</p> <p>To simulate violent flow with gas-liquid interface which is characterized by fragmentation and coalescence of fluid, particle method shows excellent performance. Firstly, basics of the particle method, namely discretization and algorithm, which is common to SPH (Smoothed Particle Hydrodynamics) and MPS (Moving Particle Semi-implicit) methods, are explained. Particle method is superior in robustness for tracking complicated interface behavior, while it suffers from existence of unphysical fluctuation of pressure. By revisiting the calculation principle of particle method, various improvements have been proposed in recent years. In this lecture, the state-of-the-art of accurate particle method is also described.</p> <p>(3) Feedback [1 time] :</p> <p>Discuss the contents of all classes and assignments. The details will be introduced in the course.</p>					
Continue to 数值流体力学(2)					

## 数值流体力学(2)

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### [Course requirements]

Basic knowledge of fluid dynamics, continuum mechanics and computational techniques

### [Evaluation methods and policy]

The final grade will be decided with the homework assignments in both the first 7 times (50%) and the second 7 times (50%). To pass, students must earn at least 60 points out of 100 points (full marks).

### [Textbooks]

No textbook assigned to the course

### [References, etc.]

#### ( Reference books )

Recommended books and papers will be introduced in the course.

### [Study outside of class (preparation and review)]

It is necessary to understand sufficiently the contents of every class. All homework assignments should be submitted.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 6F019 LJ73				
<b>Course title (and course title in English)</b>	河川マネジメント工学 River Management		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KISHIDA KIYOSHI Graduate School of Engineering Associate Professor, ONDA SHINICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
It is important to consider rivers comprehensively from the various points of view based on natural and social sciences, and engineering technology. The fundamental knowledge to consider rivers and to make the plans for river basins is explained with the following contents: various viewpoints to consider rivers, long term environmental changes of rivers and its main factors, river flows and river channel processes, the ecological system of rivers and lakes, flood and slope failure disasters, the integrated river basin planning (flood defense, environmental improvement planning, sediment transport system), functions of dam reservoir and management.					
<b>[Course objectives]</b>					
Students are requested to understand the fundamental knowledge to consider rivers and river basins comprehensively from the various points of view based on natural and social sciences, and engineering and technology.					
<b>[Course schedule and contents]</b>					
Various viewpoints to consider rivers and river basins, 3 times, Various viewpoints to consider rivers and river basins, Various rivers on the earth, Formation processes of river basins, long term environmental changes of rivers and its main factors.					
Applications of computational methods related to problems in rivers, 2 times, The following items are lectured: Computational method to predict river flows and river channel processes with sediment transport and river bed deformation.					
Recent flood disasters and Integrated river basin planning, 3 times, Characteristics of the recent flood and slope failure disasters, the Fundamental river management plan and the River improvement plan based on the River Law, Procedures to make the flood control planning, Flood invasion analysis and hazard map.					
Groundwater and its related field, 1 time, Simulation technology of groundwater, Geo-environmental issues, Reservoir Engineering, Contaminant Transport Processes.					
Sustainable development of the dam, 1 time, Needs of dam development and history of dam construction, Maintenance of the Dam reservoir.					
Hydraulic structures in rivers, 2 times, Levee, groin and fishway pass.					
Dam structure and its maintenance, 2 times, Dam structure, foundation, grouting. Design of Arch Dam and Gravity Dam.					
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Continue to 河川マネジメント工学(2)					

## 河川マネジメント工学(2)

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Achievement Confirmation and Feedback, 1 time, Comprehension check of course contents (Reports)

### **[Course requirements]**

Fundamental knowledge on Hydraulics, Hydrology and Ecology

### **[Evaluation methods and policy]**

Reports and Attendance

### **[Textbooks]**

Materials regarding the contents of this class are distributed in the class.

### **[References, etc.]**

( Reference books )

### **[Study outside of class (preparation and review)]**

Explain in the class.

### **( Other information (office hours, etc.) )**

Students can contact professors by visiting their rooms and sending e-mails.

Prof. Kishida: kishida.kiyoshi.3r@kyoto-u.ac.jp

Associate Prof. Onda: onda.shinichiro.2e@kyoto-u.ac.jp

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 5F025 LJ73 G-ENG02 5F025 LJ73				
<b>Course title (and course title in English)</b>	地盤力学 Geomechanics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MIMURA MAMORU Graduate School of Management Professor,HIGO YOUSUKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Mechanical behavior of soils and problems of its deformation and failure will be covered based on the multiphase mixture theory and the mechanics of granular materials.					
<b>[Course objectives]</b>					
The objectives of this course are to understand the basics of geomechanics, and the advanced theories.					
<b>[Course schedule and contents]</b>					
Deformation of geomaterials (1time), Mechanical property of geomaterials, critical state soil mechanics, Failure criteria, modelling of geomaterials (by Prof.Mimura)					
Field equations and constitutive model (2times), Framework and field equations for continuum, stress-strain relations for soils, elastic model, elasto-plastic model, plasticity theory (by Prof.Mimura)					
Elasto-plastic constitutive model (3times), Constitutive model for geomaterials, elasto-plastic model, Cam clay model (by Prof. Mimura)					
Theory of viscosity and viscoplasticity (3times), Viscoelasticity, viscoplasticity, Elasto-viscoplastic model, Adachi-Oka model, Microstructure of soils, Temperature dependent behavior, Applications of constitutive models (by Prof. Mimura)					
Consolidation analysis (3times), Biot's consolidation theory and its application, Consolidation of embankment (by Assoc.Prof. Kimoto)					
Liquefaction of soils (2times), Liquefaction of sandy soil, Damage and failure due to liquefaction, Remedial measures for liquefaction (by Assoc.Prof. Kimoto)					
[Confirmation of achievement]					
Feedback (1time)					
<b>[Course requirements]</b>					
Soil mechanics, Fundamentals of continuum mechanics					
Continue to 地盤力学(2)					

## 地盤力学(2)

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### [Evaluation methods and policy]

Final examination (70) and homeworks, class performance (30)

### [Textbooks]

Handout will be given.

Soil mechanics, Fusao Oka, Asakura Publishing (in Japanese)

### [References, etc.]

#### ( Reference books )

Handout will be given during the course.

### [Study outside of class (preparation and review)]

Homeworks are given during the course.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG02 5F053 LJ55    G-ENG01 5F053 LJ55			
<b>Course title (and course title in English)</b>	応用数理解析 Applied Mathematics in Civil & Earth Resources Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUKADA KAZUHIKO Graduate School of Engineering Associate Professor, SAITOU JIYUN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Linear inverse problems and nonlinear inverse problems are introduced as a basic tool to solve engineering problems. Application of data analysis to engineering problems is also introduced.					
<b>[Course objectives]</b>					
The goal is to acquire a systematic understanding of fundamental theory of the data analysis.					
<b>[Course schedule and contents]</b>					
<p>Liner problems and Generalized inverses, 5 times, Inverse problems, solution of linear inverse problems, generalized inverse, Application of vector space and singular-value decomposition</p> <p>Maximum likelihood methods, Continuous inverse problems, 4 times, Maximum likelihood Applied to inverse problem, nonlinear problems, Continuous inverse problems</p> <p>Application of data analysis, 5 times Application of data analysis to Engineering problems</p> <p>Achievement confirmation, 1 time Comprehension check of course contents.</p>					
<b>[Course requirements]</b>					
Fundamental knowledge of linear algebra and probabilistic analysis					
<b>[Evaluation methods and policy]</b>					
Evaluation is based on reports and the final examination.					
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Continue to 応用数理解析(2)					

## 応用数理解析(2)

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

William Menke (原著), 柳谷 俊 (翻訳), 塚田 和彦 (翻訳) 『離散インバース理論 逆問題とデータ解析』  
( 古今書院 ) ISBN:4772215581 ( 原著 ( Geophysical Data Analysis: Discrete Inverse Theory, 3rd Edition ) )

### [Study outside of class (preparation and review)]

Review through the report.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>		G-ENG01 7F065 LE73    G-ENG02 7F065 LE73			
<b>Course title (and course title in English)</b>	水域社会基盤学 Hydraulic Engineering for Infrastructure Development and Management		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Professor,ICHIKAWA YUTAKA Graduate School of Engineering Associate Professor,HARADA EIJI Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering Associate Professor,KIM SUNMIN Graduate School of Engineering Associate Professor,ONDA SHINICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This lecture picks up various water-related problems and provides their explanation and solution methodology related to hydrodynamic and hydrological infrastructure improvements, maintenance, disaster prevention against flood and damage of water environment, interweaving several leading-edge cases in the real world. Turbulent flow and CFD, sediment transport system and design/planning of hydraulic structure are described on the basis of the integrated management of river-and-coast systems with sediment control and these relationship with infrastructure improvement. Perspective from the viewpoint of public environmental infrastructure on water environment is presented.					
<b>[Course objectives]</b>					
Students learn about case-based practical solutions against various problems related to hydraulic engineering, and students acquire academic preparation of how to approach to public environmental infrastructure on water area.					
<b>[Course schedule and contents]</b>					
Introduction,1time,The purpose and constitution of the lecture, the method of the scholastic evaluation are explained. Hydraulics in open-channel flows,3times,Several problems and exciting topics related to hydraulics in open-channel flows are discussed with advanced practical examples. River basin management ,3times,The participants will learn (1) basic knowledge and methodologies for proper river basin management, and (2) actual issues and solving approaches regarding river basin management. Beach erosion,3times,Several problems and their solution methodology against sediment transport process in coastal zone are explained. Advanced approaches for sediment control are overviewed. Rainfall-runoff prediction and hydrologic design ,3times,Water resources issues related to rainfall-runoff prediction and hydrologic design are discussed with advanced practical examples. Numerical simulation for Hydraulic engineering,1time,Recent numerical simulation development and related state-of-the-art technologies are overviewed.					
Continue to 水域社会基盤学(2)					

## 水域社会基盤学(2)

Achievement Confirmation, 1 time, Comprehension check of course contents. The exercises to the given subjects are performed.

### [Course requirements]

hydraulics, fluid mechanics, river engineering, coastal engineering, hydrology, etc.

### [Evaluation methods and policy]

Grading is based on students activities in lectures and reports.

### [Textbooks]

Non

### [References, etc.]

#### ( Reference books )

Non

#### ( Related URLs )

(Non)

### [Study outside of class (preparation and review)]

Review fundamental items of hydraulics, fluid mechanics, river engineering, coastal engineering, hydrology, etc..

### ( Other information (office hours, etc.) )

Non

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG02 5F067 LE73    G-ENG01 5F067 LE73				
<b>Course title (and course title in English)</b>	構造安定論 Structural Stability		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SUGIURA KUNITOMO Graduate School of Engineering Associate Professor, KITANE YASUO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Fundamental concept of static and dynamic stability of large-scale structures such as bridges is to be introduced in addition to the way to keep/improve their safety and to evaluate their performance. Basic concept of structural stability and its application and technical subjects to improve safety will be lectured systematically. Furthermore, the practical solutions to the subjects are to be introduced to assure the safety of structures.					
<b>[Course objectives]</b>					
The class aims to cultivate the understanding of static and dynamic stability problems for structural system and make understand the methodology to clarify the limit state. To get knowledge on countermeasures to assure the stability which is applicable to practical design and manufacturing will be also required.					
<b>[Course schedule and contents]</b>					
Elastic Stability under Static Loading(8) Stability of Structures and Failures Basis of Structural Stability Elastic Buckling of Columns Elastic Buckling of Beams & Frames Elastic Torsional Buckling of Beams Elastic Buckling of Plates Elasto-plastic Buckling Buckling Analysis  Basic Theory of Dynamic Stability(3) Dynamic Response Characteristics of Structural System State Equation of Motion with Nonlinearities in External, Damping and Restoring Force, Stability around Equilibrium Points  Examples of Structural Instability under Dynamic Loadings(3) Instability under Nonconservative Force Instability under Periodical Force Instability under Impact Force  Achievement Check(1) Summary and Achievement Check					
Continue to 構造安定論(2)					

## 構造安定論(2)

### [Course requirements]

It is desired for participants to master structural mechanics, continuum mechanics, mathematical analysis as well as vibration theory.

### [Evaluation methods and policy]

Grading will be evaluated by written examination(80%), reports(10%) and attendance(10%).

### [Textbooks]

Not specified.

### [References, etc.]

#### ( Reference books )

Introduced in class if necessary.

#### ( Related URLs )

(none)

### [Study outside of class (preparation and review)]

Work on Assignments

### ( Other information (office hours, etc.) )

none

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG02 6F068 LE73 G-ENG01 6F068 LE73				
<b>Course title (and course title in English)</b>	材料・構造マネジメント論 Material and Structural System & Management		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Management Professor, YAMAMOTO TAKASHI Graduate School of Engineering Associate Professor, AN RIN Graduate School of Engineering Assistant Professor, TAKAYA SATOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Regarding the maintenance of concrete structures, the deterioration prediction procedures in material and structural properties will be described based on durability and deterioration processes of concrete structures. Repairing materials and methods are also introduced. Note: strengthening materials and methods will be described in Concrete Structural Engineering, provided in the second semester. In the later half of this lecture, structures are focused as groups rather than an individual structure to understand the difference between asset management and maintenance. By taking into consideration the economic aspect and human resources aspect as well as the physical aspect, the work flow of the asset management for structures with view points of the life cycle cost and the budget will be described.					
<b>[Course objectives]</b>					
Understanding the maintenance targeting individual structure and asset management for targeting structures.					
<b>[Course schedule and contents]</b>					
1. Outline of maintenance for concrete structures, 1 Outline of the durability and deterioration of concrete structures Outline of the maintenance management of concrete structures  2. Deterioration mechanisms of concrete structures and deterioration prediction, 4 Infiltration and shift of degradation factors, reaction mechanisms, deterioration of materials and adhesion characteristics, deterioration of mechanical performance  3. Repair materials and methods for concrete structures, 1 Repair materials and methods for concrete structures  4. Maintenance and asset management, 3 Overview and work flow of asset management Performance of structure  5. Maintenance for structures, 3 Inspection and its sophistication and simplification Deterioration prediction, uncertainty, and safety factors  6. Management for structures, 2 Remedial measures, LCC calculation, and levelization Prospect of asset management					
----- Continue to 材料・構造マネジメント論(2) -----					

## 材料・構造マネジメント論(2)

7. Confirmation of learning achievements, 1

### [Course requirements]

Basic knowledge on Construction Materials, Concrete Engineering and Steel Engineering.

### [Evaluation methods and policy]

Reports (60%) and mini quizzes (40% including attendance) will be assigned, and the overall score will be judged.

### [Textbooks]

Not used

Some handouts will be distributed as necessary.

### [References, etc.]

#### ( Reference books )

Introduced during class

To be introduced during class.

#### ( Related URLs )

<http://sme.kuciv.kyoto-u.ac.jp/>(Department of Civil & Earth Resources Engineering, Structural Materials Engineering (Takashi Yamamoto))

<http://csd.kuciv.kyoto-u.ac.jp/>(Department of Urban Manatement, Structures Management Engineering)

### [Study outside of class (preparation and review)]

1. Previewing the handouts.

2. Reviewing by tackling mini quizzes.

### ( Other information (office hours, etc.) )

It is expected that students will actively participate in the lectures by showing their positive presence.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 6F071 LJ77				
<b>Course title (and course title in English)</b>	応用弾性学 Applied Elasticity for Rock Mechanics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, FUKUYAMA EIICHI Graduate School of Engineering Associate Professor, MURATA SUMIHIKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Theory of elasticity relating to the deformation and failure of rock and rock mass and design of rock structures is explained. Specifically, two-dimensional analyses of elasticity using the basic equations, the constitutive equations, and the complex stress function are explained. Several applications to rock mechanics, rock engineering, and fracture mechanics are also explained. Then, strain and stress field ahead of the propagating crack is theoretically investigated. And the stress change due to the crack propagation is explained.					
<b>[Course objectives]</b>					
The goal of this class is to master the theory of elasticity so as to solve the elastic problem in rock mechanics, rock engineering, and fracture mechanics.					
<b>[Course schedule and contents]</b>					
1.-2. Airy's stress function and complex stress function (2 times) Airy's stress function used to solve a two-dimensional elastic problem is first explained, and then the complex stress functions that are the representation of Airy's stress function by the complex variables are explained.					
3.-6. Two-dimensional elastic analysis using the complex stress function (4 times) Analytical solutions of two-dimensional elastic problems in fracture mechanics and rock engineering are derived by using the complex stress functions. The mechanical behavior of rock material is also explained based on the derived solutions.					
7. Application of two-dimensional elastic analysis (1 time) The theory of rock support, ground characteristic curve, theoretical equations used for the evaluation of rock stress, which are derived from the solution of two-dimensional elastic problem, are explained.					
8.-10. Propagating two-dimensional mode 1 crack (3 times) Suddenly appeared two-dimensional mode 1 stationary crack is investigated to theoretically obtain a stress and displacement field around the crack. The solution is extended to a mode 1 crack propagating at a constant velocity. Then the solution is further extended for the cases with non-uniform propagation velocity. Finally, the same procedure is applied to obtain the solutions for mode 2 and mode 3 cracks.					
11.-12. Stress field at a crack tip and path-independent integrals (2 times) Using the two-dimensional solution for cracks propagating with non-uniform velocity, how to evaluate the stress field at the crack tip is explained. And path independent integrals around the crack tip is introduced.					
13.-14. Effects of viscoelasticity and high strain rate on the crack propagation (2 times)					
----- Continue to 応用弾性学(2) -----					

## 応用弾性学(2)

When the crack surfaces behaves viscoelastically or high strain rate is applied at the crack tip, the effects to the crack propagation are investigated in comparisons to the cases with perfect linear elasticity.

Examination (1 time)

15. Feedback (1 time)

The contents of this class are summarized. In addition, the achievement of course goals is checked.

### [Course requirements]

The knowledge and calculation skill of calculus, vector analysis and complex analysis are required.

### [Evaluation methods and policy]

Evaluation is made by the score of two report problems or homeworks (25% each) and semester final examination (50%).

### [Textbooks]

Handouts are delivered.

### [References, etc.]

#### ( Reference books )

Jaeger, J. C., N. G. W. Cook, and R. W. Zimmerman: Fundamentals of Rock Mechanics -4th ed., Blackwell Publishing, 2007, ISBN-13: 978-0-632-05759-7

Freund, L. B.: Dynamic Fracture Mechanics, Cambridge University Press, 1990, ISBN: 0-521-30330-3

#### ( Related URLs )

(Web page of this lecture is not provided. When preparing it by need, the information is shown in the class.)

### [Study outside of class (preparation and review)]

Review of the each class is required.

### ( Other information (office hours, etc.) )

Office hour is set 10:30-12:00 and 14:30-1600 on the same day of the class.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>		G-ENG01 5F073 LJ77			
<b>Course title (and course title in English)</b>	物理探査の基礎数理 Fundamental Theories in Geophysical Exploration		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MIKADA HITOSHI Graduate School of Engineering Associate Professor, TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor, XU Shibo	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
We are outlining various basic mathematical principles used for the analysis of the dynamic and kinematic earth-scientific problems in conjunction with wave propagation, mass transfer, etc. in the crust, and presenting examples of such analysis techniques in the area of earth sciences and earth resources engineering.					
<b>[Course objectives]</b>					
The aims of the class is to understand various signal-processing theories, the applied seismology, and the applied geo-electromagnetics with respect to exploration geophysics as application tools in seismology and in geo-electromagnetics.					
<b>[Course schedule and contents]</b>					
Introduction to exploration geophysics, 1time, General introduction to the lecture. Seismic wave propagation and signal processing, 8times, Acquire knowledge on the propagation phenomena of elastic waves to learn the equivalency of 1D propagation with the theory of system function. The topics included would be, z-transform, Levinson recursion, Hilbert transform, etc. Fundamentals of geo-electromagnetics and their application to exploration geophysics, 5times, Learn fundamental theories of magnetotellurics, instantaneous potential, spontaneous potential, and apparent resistivity methods, etc. that deal with geo-electromagnetic phenomena. Case studies are introduced to understand the advantages of geo-electromagnetic exploration schemes. Wave propagation problem in seismic exploration, 1time, Discussing fundamental theories of elastic wave propagation, used in subsurface structural surveys, in terms of the actual utilization and the theories of wave phenomena.					
<b>[Course requirements]</b>					
Students should understand exploration geophysics of undergraduate level.					
<b>[Evaluation methods and policy]</b>					
Rating is performed by the combination of exams (40%) and the attendance to the class (60%).					
<b>[Textbooks]</b>					
Specified in the course.					
<b>[References, etc.]</b>					
( Reference books ) Claerbout, J.F. (1976): Fundamentals of Geophysical Data Processing (Available online URL: <a href="http://sep.">http://sep.</a>					
Continue to 物理探査の基礎数理(2)					

## 物理探査の基礎数理(2)

stanford.edu/oldreports/fgdp2/)

### ( Related URLs )

(Could be specified by the lecturers if any.)

### [Study outside of class (preparation and review)]

Specified in the course.

### ( Other information (office hours, etc.) )

Visit the office.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 5F075 LJ73    G-ENG02 5F075 LJ73				
<b>Course title (and course title in English)</b>	水理乱流力学 Hydrodynamics and Turbulence Mechanics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Engineering Assistant Professor,OKAMOTO TAKAAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Guidance ,1time,Guidance and entrance level lecture about fluid dynamics and turbulence Theories of turbulence ,3times,Lectures about momentum equation, boundary layer, energy transport, vortex dynamics and spectrum analysis Turbulence in natural rivers,4times,Lectures about diffusion and dispersion phenomena observed in natural rivers. Vegetation and turbulence,3times,Lecture about turbulence transport in vegetation canopy together with introduction of recent researches Practical topics in natural rivers,2times,Lectures about compound channel and sediment transport Practical topics in hydraulic engineering,2times,Lectures about drifting object in flood and fish way					
<b>[Course requirements]</b>					
Hydraulics					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG01 5F078 LJ73 G-ENG02 5F078 LJ73				
<b>Course title (and course title in English)</b>	岩盤応力と地殻物性 Rock stress and physical properties		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, HAYASHI TAMETO Graduate School of Engineering Assistant Professor, ISHITSUKA KAZUYA 神戸大学大学院理学研究科 教授 YAMAMOTO YUZURU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In this course, we will give lectures on i) in-situ rock stress and its measurement methods, ii) physical properties and mechanical properties of rocks under large depths determined by laboratory experiments, borehole logs and geophysical survey. We will introduce new research results related to the above items in geoenvironment and geoscience research areas.					
<b>[Course objectives]</b>					
Understand the representative physical properties of rocks under high-temperature and high-pressure conditions, in-situ stress and its measurement methods and their applications in earth resource development field and in deep scientific drilling projects.					
<b>[Course schedule and contents]</b>					
Guidance: 1 class by Weiren LIN Introduce the contents of the course.					
Rock stress and its measurements: 5 classes by Weiren LIN Measurement methods of in-situ stress such as borehole compressive and tensile failure analyses, hydraulic fracturing, core-based methods; introduction of the new research achievements.					
Physical properties and strength of rocks: 4 classes by Weiren LIN Physical properties (elastic wave velocity, resistivity, fluid flow and thermal properties) and mechanical properties (strength and deformation).					
Logs and physical property analyses using log data: 2 classes by Saneatsu Saito, Principles, operation procedures, data processing and interpretation of results in deep drilling wells.					
Crustal deformation and physical property, 2 classes by Kazuya Ishitsuka Estimation of geological and physical property distribution in wide areas by explorational and remote sensing data.					
Feedback: 1 class by the all.					
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Continue to 岩盤応力と地殻物性 (2)					

## 岩盤応力と地殻物性 (2)

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### [Course requirements]

None

### [Evaluation methods and policy]

Evaluation will be based on active participation and assignments. Assignments and individual reports will be assessed on the basis of achievement level for course goals.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Independent studies by published research papers, technical books and relative websites are recommended.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 7F085 LE77 G-ENG02 7F085 LE77			
<b>Course title (and course title in English)</b>	地殻環境計測 Measurement in the earth's crust environment		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Engineering Associate Professor,NARA YOSHITAKA  Part-time Lecturer,YAMAMOTO KOJI  Part-time Lecturer,NAGANO YU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>The theories and measurement methodologies required for various engineering projects in the Earth's crust are explained. In this course, we explain them related to the geological disposal of radioactive wastes, the carbon capture and storage, and the extractions of oil and gas. Especially, we explain the characteristics and measurement methods of mechanical properties of rock and their applications to the engineering projects. Then we give lectures on the measurement methodology and novel information related to the various engineering projects in the Earth's crust.</p>					
<b>[Course objectives]</b>					
<p>The goal of this course is to understand various measurement methods conducted for rock materials in the Earth ' s crust environment. Specifically, we hope that students understand the methods to obtain the rock mechanical properties (strength, fracturing, permeability, etc.) and their importance. In addition, the understanding of the monitoring methods of mechanical behaviors for fluids, heat, and rock mass related to various engineering projects in the Earth's crust.</p>					
<b>[Course schedule and contents]</b>					
<ul style="list-style-type: none"> <li>• Topic 1: Measurement of mechanical properties of rock under various environment (Class number of times: 5) Description: At first, various engineering projects in the Earth's crust are introduced. Then, the measurement methodologies of mechanical properties (strength, fracturing, permeability, etc.) of rock under different environmental conditions and their importance are described. In addition, the relationships between mechanical properties of rock and engineering projects in the Earth's crust, especially the radioactive waste disposal and the carbon capture and storage, are described.</li> <li>• Topic 2: Rock Friction and Induced Seismicity: Generation and Monitoring (Class number of times: 5) Description: Induced seismicity is one of the unstable factors during the development of natural resources in the earth's crust. Induced seismicity is controlled by the preexisting crack geometry, effective stress field including pore pressure, and static and dynamic friction of rocks. In this course, the measurement techniques of these physical quantities will be overviewed. Then, we discuss how to mitigate the damages from induced seismicity by monitoring these quantities.</li> <li>• Topic 3: Effect of rock stress on oil and gas exploration (Class number of times: 4) Description: Estimation of rock stress condition by hydraulic fracturing and logging, which is conducted at</li> </ul>					
Continue to 地殻環境計測(2)					

## 地殻環境計測(2)

various steps for oil and gas exploration, will be explained. Importance of rock stress affecting on borehole stability will be explained as well.

- Topic 5: Confirmation of understanding

(Class number of times: 1)

Description: The confirmation of understanding will be done by the feedback through tests.

### [Course requirements]

It will be better to complete “ Engineering Geology ” and “ Rock Engineering ” in the undergraduate course.

### [Evaluation methods and policy]

Grading will be made by the scores of reports and achievement tests (60%), and the class activity (40%).

### [Textbooks]

None. Handouts will be given in classes when needed.

### [References, etc.]

#### ( Reference books )

- 1) Amadei, B. & Stephansson, O.: Rock Stress and Its Measurements, Capman & Hall, 1977.
- 2) Vutukuri, V. S. & Katsuyama, K.: Introduction to Rock Mechanics, Industrial Publishing & Consulting, Inc., Tokyo, 1994.
- 3) Paterson, M.S. & Wong, T-F.: Experimental Rock Deformation #8211 The Brittle Field, Springer, 2005.

### [Study outside of class (preparation and review)]

Some reports will be required to check the understanding of the contents of classes.

### ( Other information (office hours, etc.) )

This class is made by English.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 5F089 LJ73 G-ENG02 5F089 LJ73				
<b>Course title (and course title in English)</b>	社会基盤安全工学 Infrastructure Safety Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Program-Specific Professor, OHTA NAOYUKI Graduate School of Engineering Assistant Professor, YASUDA NAOTOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The issues concerning the safety and reliability of infrastructures such as tunnels and bridges and also the issues on natural disaster are reviewed in the lecture.					
<b>[Course objectives]</b>					
To understand the basic technologies to enhance the safety of structures and also the fundamentals on disaster prevention.					
<b>[Course schedule and contents]</b>					
1. Lecture schedule and content explanation Give an overall explanation of this lecture and show the goals and goals to be understood  2. Introduction to Railway Disaster Prevention System Main contents of natural disasters suffered by infrastructure equipment and measures taken to ensure safety  3. practice of safety measures against natural disasters (1) • Necessity of traffic regulation during heavy rain, various methods and issues  4. Practice of Safety Measures Against Natural Disasters (2) • Algorithm of early detection method of earthquake motion and Shinkansen and Earthquake Early Warning  5. Practice of safety measures against natural disasters (3) • Specific measures for train safety during strong winds and heavy snowfall  6. Search for problems from the measures actually taken by the railway when the typhoon passed  7. Disaster prevention weather information and weather statistics Disaster prevention weather information and extreme value statistics important for the safety of social infrastructure facilities  8. Introduction to maintenance of linear structures Maintenance method for linear structures such as roads and railways  9. Current status and issues of maintenance methods for each structure (1) • Maintenance of ground structures such as embankments and cuts  10. Current status and issues of maintenance methods for each structure (2)					
----- Continue to 社会基盤安全工学(2) -----					



## 社会基盤安全工学(2)

- Tunnel maintenance technology

11. latest technology in structural inspection

The twelfth method of decision-making of measures by risk evaluation

Disaster risk evaluation and disaster prevention investment decision-making method using probabilistic methods

13. site tour (1)

By observing the railway facilities, you can get a first-hand feel of what specific measures are being taken as safety and disaster prevention measures for infrastructure equipment.

14. site tour (2)

Consider issues related to safety measures from the information obtained from the site tour

15. issue review feedback

Based on the knowledge gained in the class, think about questions about safety measures for social infrastructure structures and future prospects, and give explanations based on the results.

### [Course requirements]

Basic knowledge on statistics is required. Students should have taken the course of geo-mechanics, structural mechanics and concrete engineering.

### [Evaluation methods and policy]

Evaluation method]

Exam results (60%)

Normal score evaluation (40%)

Normal score evaluation includes evaluation of small reports imposed during class

[Evaluation policy]

Pass 60 points or more

### [Textbooks]

Distribute prints every time

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

No special preparation is required, but it is desirable to review to understand the content of each lecture.

Continue to 社会基盤安全工学(3)

社会基盤安全工学(3)

( Other information (office hours, etc.) )

confirm the attendance at every lecture

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 7F100 LE73    G-ENG02 7F100 LE73			
<b>Course title (and course title in English)</b>	応用水文学 Applied Hydrology		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor,HORI TOMOHARU Disaster Prevention Research Institute Professor,SUMI TETSUYA Disaster Prevention Research Institute Associate Professor,TAKEMON YASUHIRO Disaster Prevention Research Institute Associate Professor,TANAKA KENJI Disaster Prevention Research Institute Associate Professor,Sameh Kantoush	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Applied and integrated approach to the problems closely related to the water circulation system, such as floods, droughts, water contamination, ecological change, and social change is introduced mainly from the hydrological viewpoint with reference to water quantity, quality, ecological and socio-economic aspects. In the course, several actual water problems are taken up and solving process of each problem which comprises of problem-identification and formulation, impact assessment, countermeasures design and performance evaluation is learned through the lectures's description and also investigation and discussion among the students.					
<b>[Course objectives]</b>					
To obtain fundamental Knowledge and skills to perform problem definition, survey and countermeasure design on problems about water use, water hazard mitigation and water environment.					
<b>[Course schedule and contents]</b>					
The 1st - 2nd Classes: Water disasters and risk management Risk assessment of water disasters, countermeasures and adaptation design, water disasters and human security					
The 3rd - 4th Classes: Reservoir Systems and Sustainability Reservoir system and its environmental impacts, Sustainable management of reservoir system					
The 5th - 7th Classes: Hydrological Measurements of Large River Basins Design and management of hydrological measurement system in large river basins					
The 8th - 10th Classes: Land Surface Processes Observation and modelling of land surface processes, Application of land surface model					
The 11th - 13th Classes: Hydro-eco Systems Ecohydrological management of habitats in river ecosystems, Ecohydrological management of biodiversity in wetland ecosystems					
The 14th - 15th Classes: Survey and Exercise study and exercise for given topics					
----- Continue to 応用水文学(2) -----					

## 応用水文学(2)

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### [Course requirements]

Elementary knowledge of hydrology and water resources engineering.

### [Evaluation methods and policy]

Grading is based on student activities in lectures, presentation (about 20%) and reports (about 80%).

### [Textbooks]

Printed materials on the contents of this class are distributed in class.

### [References, etc.]

#### ( Reference books )

None

### [Study outside of class (preparation and review)]

Review work based on handouts and report work for issues given in the classes are required.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 6F103 LE73			
<b>Course title (and course title in English)</b>	環境防災生存科学 Case Studies Harmonizing Disaster Management and Environment Conservation		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor, NAKAKITA EIICHI Disaster Prevention Research Institute Professor, MORI NOBUHITO Disaster Prevention Research Institute Professor, KAWAIKE KENJI Disaster Prevention Research Institute Associate Professor, SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor, YAMAGUCHI KOSEI Disaster Prevention Research Institute Associate Professor, SHIMURA TOMOYA Disaster Prevention Research Institute Senior Lecturer, LAHOURNAT, Florence	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Environmental impacts by infrastructure for disaster prevention and mitigation are discussed. Introducing various examples of natural disasters, degradation of the environment, and harmonizing disaster management and environmental conservation in the world, this classroom carries on a dialogue about effective measures for reducing negative environmental impacts and serious disasters.					
<b>[Course objectives]</b>					
Conservation of the environment and prevention/mitigation of natural disasters, which are very important for human's survivability, often conflict with each other. This course introduces various examples. Students will learn many examples harmonizing these two issues, and shall consider technical and social countermeasures fitting to the regional characteristics.					
<b>[Course schedule and contents]</b>					
Hajime Nakagawa / River environment and disaster					
Eiichi Nakakita / Heavy rainfall -using radar nowcasts and climate change-					
Nobuhito Mori / Climate change and impact assessment on coastal environment					
Takahiro Sayama / Hydrological processes and water disaster predictions					
Kosei YAMAGUCHI/ Heavy rainfall -prediction of severe storm					
Florence LAHOURNAT/ Traditional narratives of disaster: adaptation, meaning making,					
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Continue to 環境防災生存科学(2)					

## 環境防災生存科学(2)

### [Course requirements]

No special knowledge and techniques are necessary, but requires reading, writing and discussing in English in the class.

### [Evaluation methods and policy]

Considering both the number of attendances and the score of final test at the end of the semester.

### [Textbooks]

No particular textbook for this course. Necessary documents and literature introduction are provided in the class room from time to time.

### [References, etc.]

#### ( Reference books )

Some literature would be introduced by professors.

### [Study outside of class (preparation and review)]

No specific requirement for independent study. Collect information broadly regarding environment and disaster related topics.

### ( Other information (office hours, etc.) )

Contact Associate Professor Mori email;mori.nobuhito.8a@kyoto-u.ac.jp, if you have any query.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 5F106 LE16 G-ENG02 5F106 LE16			
<b>Course title (and course title in English)</b>	流域管理工学 Integrated Disasters and Resources Management in Watersheds		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor,FUJITA MASAHARU Disaster Prevention Research Institute Professor,HIRAISHI TETSUYA Disaster Prevention Research Institute Associate Professor,YONEYAMA NOZOMU Disaster Prevention Research Institute Professor,KAWAIKE KENJI Disaster Prevention Research Institute Associate Professor,TAKEBAYASHI HIROSHI Disaster Prevention Research Institute Associate Professor,BABA YASUYUKI Disaster Prevention Research Institute Assistant Professor,MIYATA SYUUSUKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Mechanism and countermeasures of sediment disasters, flood disasters, urban flood disasters and coastal disasters are explained. An integrated watershed management of these disasters and water/sediment resources is also introduced. This lecture will be open at Katsura Campus and Ujigawa Open Laboratory.					
<b>[Course objectives]</b>					
Learn an integrated basin management system for natural disasters (sediment disasters, food disasters, coastal disasters, urban flood disasters) mitigation and water/sediment resources utilization considering environmental conservation.					
<b>[Course schedule and contents]</b>					
<p>Introduction,1time,Contents of this lecture are explained.</p> <p>Urban flood disaster managemnet,2times,We review urban floods from the viewpoint of river basins, flood causes, and features, together with the results of recent studies. Based on these studies, we propose comprehensive measures against urban floods, including underground inundations. In addition, we discuss on prediction methods of the tsunami disaster in urban area.</p> <p>Flood disaster management,2times,Prevention / mitigation measures against flood disasters and flood prediction methods are explained as well as examples of recent flood disasters in Japan.</p> <p>Sediment disaster management,2times,Showing the problems on sediment disasters and sediment resources, I explain an integrated sedimnet management system both for sediment disasters and sediment resources.</p> <p>Coastal disaster management,2times,Coastal erosion and tsunami hazard become remarkable in these days in Japanese coast. In a lecture, we discuss on characteristics of such coastal disasters.</p> <p>Exercise on flood disaster at Ujigawa Open Laboratory, 5 times,Experiment and analysis on debris flows, riverbed variation and flooding at Ujigawa Open Laboratory, Fushimi-ku, Kyoto city.</p> <p>Evaluation of proficiency level, 1 times,Students confirm the proficiency level in this lecture.</p>					
Continue to 流域管理工学(2)					

## 流域管理工学(2)

### [Course requirements]

Hydraulics, River Engineering, Coastal Engineering, Sediment Transport Hydraulics

### [Evaluation methods and policy]

Evaluation will be based on active participation (10 points), assignments (6 lecturers, 15 points each), Assignments will be assessed on the basis of achievement level for course goals.

- Those who are absent more than four times will not be credited.
- The assignments with high problem consciousness, originality and new ideas will be given a high score.

### [Textbooks]

Not used  
None

### [References, etc.]

#### ( Reference books )

Introduced during class  
None

### [Study outside of class (preparation and review)]

This lecture is related to hydraulics, coastal engineering, hydrology and river ecology. Therefore we strongly recommend reviewing these subjects and the contents of the lecture should be well understood through report making.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG01 6F109 LE73    G-ENG02 6F109 LE73				
<b>Course title (and course title in English)</b>	地盤防災工学 Disaster Prevention through Geotechnics		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor, UZUOKA RYOSUKE Disaster Prevention Research Institute Assistant Professor, UEDA KYOHEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The lecture covers nonlinear continuum mechanics, dynamic three-phase analysis of ground and geotechnical structures, and fundamental behavior of saturated/unsaturated soil during geo-hazards. The lecture ranges from fundamental mechanics of granular materials to numerical simulation.					
<b>[Course objectives]</b>					
Successful students will have the ability to initiate their own research work on geo-hazards based on the solid understanding of the mechanics of granular materials and numerical analysis.					
<b>[Course schedule and contents]</b>					
<p>Week 1: Introduction</p> <ul style="list-style-type: none"> <li>- Introduction to the course (objectives, contents, and grading procedure)</li> <li>- Geo-hazards induced by heavy rain and earthquake</li> <li>- Application of numerical analysis to predict the geo-hazards</li> </ul> <p>Week 2-4: Nonlinear continuum mechanics 1</p> <ul style="list-style-type: none"> <li>- Vector and tensor algebra</li> <li>- Kinematics (motion and strain tensors)</li> <li>- Concept of stress tensors</li> </ul> <p>Week 5-7: Nonlinear continuum mechanics 2</p> <ul style="list-style-type: none"> <li>- Balance Principles</li> <li>- Objectivity and stress/strain rates</li> <li>- Constitutive laws</li> </ul> <p>Week 8-10: Fundamentals of dynamic three-phase analysis for geo-hazards</p> <ul style="list-style-type: none"> <li>- Porous media theory</li> <li>- Balance laws and constitutive equations</li> <li>- Numerical method</li> </ul> <p>Week 11-13: Soil dynamics and unsaturated soil mechanics</p> <ul style="list-style-type: none"> <li>- In-situ survey, laboratory tests</li> <li>- Cyclic deformation and strength properties of saturated soil</li> <li>- Deformation and strength properties of unsaturated soil</li> </ul> <p>Week 14-15: Applications of numerical analysis for geo-hazards</p> <ul style="list-style-type: none"> <li>- Liquefaction</li> </ul>					
Continue to 地盤防災工学(2)					

## 地盤防災工学(2)

- Landslide

### [Course requirements]

None

### [Evaluation methods and policy]

Assignments and class performance

### [Textbooks]

Handouts

### [References, etc.]

#### ( Reference books )

Gerhard A. Holzapfel: Nonlinear Solid Mechanics: A Continuum Approach for Engineering, Wiley.

Javier Bonet, Antonio J. Gil, Richard D. Wood: Nonlinear Solid Mechanics for Finite Element Analysis: Statics, Cambridge University Press.

### [Study outside of class (preparation and review)]

Fundamental soil mechanics

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 6F113 LE95			
<b>Course title (and course title in English)</b>	グローバル生存学 Global Survivability Studies		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIYONO JIYUNJI Graduate School of Engineering Professor, FUJII SATOSHI Disaster Prevention Research Institute Professor, Cruz Ana Maria Disaster Prevention Research Institute Associate Professor, SAYAMA TAKAHIRO Graduate School of Advanced Integrated Studies in Human Survivability Program-Specific Associate Professor, SHIMIZU MIKA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Modern global society is facing risks or social unrests that are caused by huge natural hazards and disasters, man-made disasters and accidents, regional environmental change/degradation including infectious diseases, and food security. Introducing such examples at global and regional scales, this subject lectures how to cope with them at national, local and community levels for making the society sustainable/survivable. Future countermeasures are also discussed under the uncertain circumstances such as climate change, population growth, energy and socio-economic issues.					
<b>[Course objectives]</b>					
The objectives of this class are to have basic knowledge about global issues threatening safety and security of the earth society such as catastrophic natural disasters, man-made disasters and accidents, regional environmental change (including infectious diseases) and food security, and to enhance students' ability to express his/her own ideas and discuss with professors and students from other study areas.					
<b>[Course schedule and contents]</b>					
1. Introduction of Global Survivability Studies Introduction of Global Survivability Studies.					
2. Why we need GSS? Discuss on why we need Global Survivability Studies (GSS). Global agendas for sustainable development and resilient societies					
3. Discuss on global agendas for sustainable development and resilient societies.					
4. Earthquake disaster mitigation Discuss on earthquake disaster mitigation focusing on lessons learnt from Tohoku EQ.					
5. Mitigation of earthquake damage to historic structures Discuss on the mitigation of earthquake damage to historic structures.					
6. Building national resilience in Japan Discuss on building national resilience based on Japanese experiences.					
Continue to グローバル生存学(2)					

## グローバル生存学(2)

### 7. Globalism as totalitarianism

Discuss on globalism as totalitarianism.

### 8. Public policy and systems approach for global changes in disaster risks

Lecture and group work on public policy and systems approach for global changes in disaster risks.

### 9. Disaster risk management and governance for global changes

Lecture and group work on disaster risk management and governance for global changes.

### 10. Water-related disaster risk management

Discuss on water-related disaster risk management: concept and recent experiences.

### 11. Water cycle and climate change, 1time

Discuss on water cycle and climate change

### 12-15. Presentation by students; discussions

Presentation by students related to this lectures and discussions on the presented topics.

## [Course requirements]

Nothing special.

## [Evaluation methods and policy]

Attendance to lectures (40%) and Presentation and discussion (60 %).

## [Textbooks]

Nothing special.

## [References, etc.]

### ( Reference books )

Nothing special.

## [Study outside of class (preparation and review)]

If handouts (teaching materials) are distributed (or downloaded from the website), students should read them prior to the class. They may be distributed at the classroom (or put on the website). Students can make use of them after the class for reviewing lectures and preparing presentation materials and discussion sessions which will be organized in the latter half of the semester.

## ( Other information (office hours, etc.) )

This subject is compulsory for students enrolled in the Inter-Graduate School Program for Sustainable Development and Survivable Societies. Students other than ones in Graduate School of Engineering should submit a registration card for taking this class.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG02 7F201 LB58 G-ENG01 7F201 LB58				
<b>Course title (and course title in English)</b>	都市社会情報論 Information Technology for Urban Society		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Global Environmental Studies Associate Professor, YAMAGUCHI KEITA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The advancement of urban society by the use of information has been realized through the remarkable development of informational communication technology. This seminar has the discussions about the worth and affect in the urban society using engineering and economic estimation method, and lectures about the way of maintenance, operation and management of urban systems in the advanced informational and knowledge-intensive society.					
<b>[Course objectives]</b>					
to understand the way of maintenance, operation and management of urban systems in the advanced informational and knowledge-intensive society.					
<b>[Course schedule and contents]</b>					
Outline,1time Series of lectures on a topic given by different professors,13times Summary and feedback,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluation by four papers (Details will be provided in the first lecture)					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) None					
<b>[Study outside of class (preparation and review)]</b>					
Details will be provided in the first lecture.					
<b>( Other information (office hours, etc.) )</b>					
Details will be provided in the first lecture.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG01 5F203 LE73    G-ENG02 5F203 LE73			
<b>Course title (and course title in English)</b>	公共財政論 Public Finance		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, MATSUSHIMA KAKUYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The structure of the economy of a nation will be explained using the concepts of the macroeconomic model, input-output analysis, and the general equilibrium model in order to understand the budget of central governments or municipalities and public fiscal policy concerning its execution. Specifically, the definition of GDP and SNA (System of National Accounts), input-output analysis and general equilibrium analysis, the IS-LM model and the AD-AS model in Keynesian macroeconomics, the international economic model, and the economic growth model will be explained while taking up specific examples.					
<b>[Course objectives]</b>					
Understanding the budget of the central government or municipalities and the public finance of its execution					
<b>[Course schedule and contents]</b>					
Outline (1 time) The overall flow of the lecture will be explained.					
GDP and social accounting (2 times) The definition of GDP and the principle of equivalence of three aspects will be explained.					
Input-output table and general equilibrium model (2 times) The input-output table explaining the flow of transactions between industries, and the role of the general equilibrium model using it will be explained.					
IS-LM Model (2 times) The IS-LM model for the goods and financial markets will be explained.					
International economics (2 times) The balance of payments and foreign exchange, as well as the IS-LM model considering international transactions will be explained.					
AD-AS Model (2 times) The AD-AS model for the middle term will be explained.					
Economic growth model (2 times) The economic growth model analyzing long-term economic growth will be explained.					
Summary (1 time) Summary of the entire course and confirmation of learning achievements					
----- Continue to 公共財政論(2) -----					

## 公共財政論(2)

<<Final Exam>>

Feedback (1 time)

Feedback of the class

### [Course requirements]

Preliminary knowledge on microeconomics ( “ public economics ” subject of the Global Engineering Department) is desirable.

### [Evaluation methods and policy]

Points given for class participation (attendance, reports, quizzes, etc.) make up 30 to 40%.  
The final examination makes up 60 to 70%.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Dornbusch et al., Macroeconomics 13rd edition, Mcgrow-hill, 2017

#### ( Related URLs )

(will be notified in the first class.)

### [Study outside of class (preparation and review)]

It is advisable to read newspaper/articles in macroeconomics in advance.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG02 5F207 LJ73    G-ENG01 5F207 LJ73				
<b>Course title (and course title in English)</b>	都市社会環境論 Urban Environmental Policy		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI Graduate School of Management Associate Professor,Ooba TETSU HARU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This lecture aims to learn urban environmental policy and its fundamental theory and methodology to solve social and environmental problems that occur in urban area as well as to understand the structure of these problems.					
<b>[Course objectives]</b>					
to understand the structure of social and environmental problems in urban area and urban environmental policy, its fundamental theory and methodology to solve the problems					
<b>[Course schedule and contents]</b>					
<p>Outline,1time</p> <p>Structure of urban problems,3times Expansion of urban areas, Increase of Environmental impact, Making compact cities</p> <p>Basic theory of transportation and environment,2times Downtown activation, Road space re-allocation, Pedestrianisation</p> <p>Road traffic and Public transportation,2times Characteristics of traffic modes, Light Rail Transit, Bus Rapid Transit, Mobility Management</p> <p>Fundamental theory for measurements of environmental values,3times Utility, Equivalent Surplus, Compensating Surplus</p> <p>Methodology to measure environmental values,3times Travel Cost Method, Hedonic Approach, Contingent Valuation Method, Conjoint Analysis</p> <p>Summary and feedback,1time,</p>					
<b>[Course requirements]</b>					
basic knowledge of public economics is required					
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Continue to 都市社会環境論(2)					



## 都市社会環境論(2)

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### [Evaluation methods and policy]

evaluation by commitment, tests, reports and examination

### [Textbooks]

Not used

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Review of each class is required.

### ( Other information (office hours, etc.) )

Office our : Check on KULASIS

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 6F215 LJ73 G-ENG02 6F215 LJ73				
<b>Course title (and course title in English)</b>	交通情報工学 Intelligent Transportation Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, UNO NOBUHIRO Graduate School of Management Professor, YAMADA TADASHI Graduate School of Engineering Assistant Professor, NAKAO SATOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This class provides you with the outlines of engineering methodology with information and communication technology as its core element for improving the safety, efficiency and reliability of traffic and transportation systems and reducing the environmental burden. Concretely, we discuss the applicability of countermeasures, such as Travel Demand Management, modal-mix in transportation systems, traffic safety improvement schemes for relieving contemporary problems in traffic and transportation systems, in addition to brief introduction of innovative approaches to collect high-quality of real-time traffic data. Moreover, the methodology for policy evaluation and the related basic theory are explained.					
<b>[Course objectives]</b>					
Goal of this class is to cultivate basic and critical abilities of students for implementing effective traffic and transportation management using ITS (Intelligent Transportation System).					
<b>[Course schedule and contents]</b>					
Basics for Transportation Network Analysis, 1time, Estimation of OD Traffic Volume using Observed Link Traffic Counts, 1time, Analytical Approaches Based on Transportation Network Equilibrium, 4times, Outlines of ITS, 1time, Traffic Management for Enhancing Efficiency, 2times, Innovative Approaches for Data Collection Using ICT, 1time, Application of ITS for Enhancing Traffic safety, 1time, Travel Demand Management and Congestion Charging, 2times, Application of Traffic Simulation, 2times, Feedback of evaluation of report examination to students, 1time, , 1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Final report: 45% (including quizzes), Mid-term report: 45% and Mark given for class participation: 10%					
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Continue to 交通情報工学(2)					

## 交通情報工学(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

The instructions about home study will be available in the class.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 6F219 LJ34				
<b>Course title (and course title in English)</b>	人間行動学 Quantitative Methods for Behavioral Analysis		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,FUJII SATOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,3times, ,3times, ,3times, ,3times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG01 5F223 LE24			
<b>Course title (and course title in English)</b>	リスクマネジメント論 Risk Management		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor, Cruz Ana Maria	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The aim of the class is to provide the basic knowledge of risk management methods for various types of risks such as natural disaster, environment and natural resources in urban and rural areas. Students will learn the decision making principle under risks in Economics and asset pricing methods in Financial Engineering as well as have exercises of application on public project problems.					
<b>[Course objectives]</b>					
It is targeted to understand 1) representative concepts of risk and risk management process, 2) expected utility theory and 3) foundation of Financial Engineering, and examine 4) public project problems by applying the above knowledge.					
<b>[Course schedule and contents]</b>					
Basic framework of risk management, 2times, 1-1 Representative concept of risk 1-2 Risk management technologies Decision making theory under risks, 3times, 2-1 The Bayes#039 theorem 2-2 The Expected utility theory Financial engineering, 6times, 3-1 The Capital Asset Pricing Model 3-2 Option pricing theory 3-3 The arbitrage theorem 3-4 The Black-Scholes formula Decision making methods for projects, 3times, 4-1 The decision tree analysis 4-2 The real option approach Comprehension check, 1time, 5 Comprehension check					
<b>[Course requirements]</b>					
Fundamental understanding of probability					
<b>[Evaluation methods and policy]</b>					
20% of score is valuated on attendance and discussion in classes, and 80% on reports.					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( <b>Reference books</b> )					
1. Ross, S.M.: An Elementary Introduction To Mathematical Finance, Cambridge University Press, 19992. Sullivan W.G.: Engineering Economy, Pearson, 2012					
<b>[Study outside of class (preparation and review)]</b>					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG01 5F227 LJ73 G-ENG02 5F227 LJ73				
<b>Course title (and course title in English)</b>	構造ダイナミクス Structural Dynamics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKAHASHI YOSHIKAZU Disaster Prevention Research Institute Professor, IGARASHI AKIRA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>This course deals with dynamics of structural systems and related topics, to provide the theoretical basis to deal with the problems of vibration, safety under dynamic loads and health monitoring associated with infrastructures. The students will study the dynamic response, properties of natural modes and methods of eigenvalue analysis for multi-DOF systems. The topics on the numerical time integration schemes, probabilistic evaluation of structural response to random excitation, and dynamic response control techniques for structures are also studied.</p>					
<b>[Course objectives]</b>					
<p>(1) To acquire the knowledge on theories and principles of analysis of MDOF systems (2) Systematic understanding of frequency-domain structural response analysis (3) Concept of analysis of numerical time integration schemes (4) Understanding of fundamentals of the random vibration theory</p>					
<b>[Course schedule and contents]</b>					
<p>Introduction (1 week) The fundamental concepts of structural dynamics and the scope of the problem to be treated are described, and the outline of the theoretical framework of methodologies for analysis is overviewed.</p> <p>Dynamics of Multi-Degree-Of-Freedom Systems (2 weeks) Basic concepts, including the formulation of vibration model of multi-degree of freedom systems, eigenvalue analysis, normal modes and modal analysis of linear systems and modeling of system damping, are described.</p> <p>Frequency-Domain Analysis of System Response (1 week) Methodology of response analysis of linear systems based on the concept of the frequency response function, and the relationship between the frequency-domain analysis and time-domain response via Fourier integral, mathematical operation and numerical procedure are described.</p> <p>Numerical Time Integration (2 weeks) Overview of the step-by-step time integration method used for numerical response analysis in the time domain is followed by the implication and mathematical analysis of the characteristics of the integration method, including stability and accuracy.</p> <p>Random Vibration (6 weeks) The methodology for stochastic modeling of inputs when the dynamic load on the structure can not be deterministically specified is shown, and the concept, theory and method for probabilistic evaluation of the dynamic response of the structures are described.</p>					
<p style="text-align: right;">Continue to 構造ダイナミクス(2)</p>					

## 構造ダイナミクス(2)

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### Structural Response Control (2 weeks)

The concept of dynamic response control of structures, in particular the active control and semi-active control, is described, and the standard theories for analysis and design are introduced.

### Achievement Evaluation (1 week)

Students' achievements in understanding of the course material are evaluated.

### [Course requirements]

Mechanical vibration (undergraduate level), Complex calculus (integration of analytic functions, Fourier transform, etc.), Probability theory, Linear algebra

### [Evaluation methods and policy]

Based on the results of a final examination (90%), plus homework assignments (10%)

### [Textbooks]

Not used; Class hand-outs are distributed when necessary.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

There will be homework assignments at the end of most of the lectures.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 7F241 LJ73 G-ENG02 7F241 LJ73				
<b>Course title (and course title in English)</b>	ジオコンストラクション Construction of Geotechnical Infrastructures		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMURA MAKOTO Graduate School of Engineering Professor, KISHIDA KIYOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Advanced construction technology of geo infrastructures, such as tunnel, large underground cavern, foundation, culvert, retaining wall, is introduced and explained. And, the practical projects applied by the advanced construction technology are also introduced.					
<b>[Course objectives]</b>					
To learn the advanced construction technology and to propose the project and design through the advanced construction technology.					
<b>[Course schedule and contents]</b>					
<p>Guidance, Introduction of construction of geotechnical infrastructures, 1 time, Guidance, Introduction of construction of geotechnical infrastructures</p> <p>Geo-investigation and survey techniques, 2 times, Introduction of the advanced geo-investigation and survey techniques. Explanation of inversion theory and technique.</p> <p>Auxiliary methods of mountain tunnel, 2 times, Introduction of NATM for construction of tunnel and underground cavern. In addition, the role of auxiliary methods, auxiliary method for safety in tunnel construction, auxiliary methods for preservation of the surrounding environment are explained</p> <p>Rock physics and its applications, 2 times, Introduction of the constitutive law of rock material and rock physics (pressure solution) and its application fields, such as special projects of underground space, namely, nuclear waste disposal, and Carbon Capture and Storage.</p> <p>Field visit or special lecture, 1 time, Visit the construction field or invite special lecture who is the expert engineer on the construction of geotechnical infrastructures.</p> <p>Foundation, 2 times, Design and construction of pile foundation and steel pipe sheet piles</p> <p>Culvert, 2 times, Design and construction of box type and arch type culverts</p> <p>Retaining wall, 2 times, Design and construction of retaining wall</p> <p>Examination of understanding, 1 time,</p>					
<b>[Course requirements]</b>					
Soil mechanics, Rock mechanics					
<b>[Evaluation methods and policy]</b>					
Attendance and Report (20 %), Examination (80 %)					
<b>[Textbooks]</b>					
Not used					
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Continue to ジオコンストラクション(2)					



## ジオコンストラクション(2)

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### [References, etc.]

#### ( Reference books )

日本材料学会編 『ロックメカニクス』

### [Study outside of class (preparation and review)]

Students should be reviewed the exercises which are learned at the class.

### ( Other information (office hours, etc.) )

Office hour will be explained at the guidance. Students can contact with professors as an e-mail.

kimura.makoto.8r@kyoto-u.ac.jp

kishida.kiyoshi.3r@kyoto-u.ac.jp

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 6F245 LE73 G-ENG02 6F245 LE73				
<b>Course title (and course title in English)</b>	開水路の水理学 Open Channel Hydraulics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, ONDA SHINICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The following topics are systematically explained; basic theories and analysis methods of open channel flows required in water engineering and river engineering. Derivation of the depth-averaged model of open channel flow, water surface profile analysis of open channel steady flow and application of singularity theory, basic characteristics of unsteady flow in open channel and application of the method of characteristic, basic characteristics of plane 2D unsteady flow, the introduction of higher-order theories (Boussinesq equation, the analysis method of coexisting unsteady flow in pipelines and open channels, etc.)					
<b>[Course objectives]</b>					
To be able to understand the basic theory of open channel flow and to be able to deal with actual problems related to rivers etc., including the selection of basic equations and analysis methods.					
<b>[Course schedule and contents]</b>					
<p>Guidance(1time)</p> <p>The contents of this subject are introduced, overviewing the whole framework of Open Channel Hydraulics with various theoretical and computational results.</p> <p>Application of singular point theory to water surface profile analysis(1time)</p> <p>The application of singular point theory to water surface profile analysis is explained.</p> <p>1-D analysis of unsteady open channel flows(3times)</p> <p>Fundamental characteristics of 1-D unsteady open channel flows, Method of Characteristics, Dam break flows, Computational methods for shallow water equations</p> <p>Derivation of 2-D depth averaged model(1time)</p> <p>Derivation procedures of the plane 2-D depth averaged flow model are explained in detail.</p> <p>Plane 2-D analysis of flows(5times)</p> <p>Shear layer instability, application of a generalized curvilinear coordinate to river flow computation, application of a moving coordinate system, etc.</p> <p>Higher order theory(3times)</p> <p>Boussinesq equation with the effect of vertical acceleration, mixed flows with pressurized flows, and free surface flows observed in a sewer network system Achievement Confirmation and Feedback(1time)</p> <p>The understanding of the contents on Open Channel Hydraulics is confirmed through the regular examination.</p> <p>Regarding the questions, students can send e-mails to Onda, S.</p>					
Continue to 開水路の水理学(2)					

## 開水路の水理学(2)

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### [Course requirements]

Basic knowledge on hydraulics and fluid dynamics

### [Evaluation methods and policy]

Mainly, regular examination

### [Textbooks]

Materials on the contents of this class are distributed in class.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Give appropriate instructions.

### ( Other information (office hours, etc.) )

Students can contact Onda by sending an e-mail to [onda.shinichiro.2e@kyoto-u.ac.jp](mailto:onda.shinichiro.2e@kyoto-u.ac.jp).

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG02 8F251 PB58 G-ENG01 8F251 PB58				
<b>Course title (and course title in English)</b>	自主企画プロジェクト Exercise on Project Planning		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, TAKEKAWA JUNICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
The purpose of this seminar is to bring out the self-initiative, the planning ability, the creativity of students. From project and to practice, the students set up the goals of projects, go ahead with the projects by themselves, and finally make the presentations of project results. Specifically, about the internship activities in enterprises, the training activities in enterprises or universities at home and abroad, the planning and operation of collaborative projects with citizen, the student makes the perfect plannings including the purposes, the ways, the results and so on. For a final, the students do practice, they write the reports and make the presentations about the project results.					
<b>[Course objectives]</b>					
Goals are cultivating ability for self-initiative, planning and creativity.					
<b>[Course schedule and contents]</b>					
Course introduction: 1 time Proposal of project: 6 times (by June) Implementation of project: 12 times (from June to December) Progress report: 1 time (by October) Final report: 8 times (deadline for submission: early January) Presentation: 2 times (early January)					
<b>[Course requirements]</b>					
There is no specific requirement for taking this course.					
<b>[Evaluation methods and policy]</b>					
Planning, implementation of project and reports are comprehensively evaluated.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Details are provided by adviser.					
<b>( Other information (office hours, etc.) )</b>					
Details are provided in the first lecture.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG01 5F261 LE73 G-ENG02 5F261 LE73				
<b>Course title (and course title in English)</b>	地震・ライフライン工学 Earthquake Engineering/Lifeline Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIYONO JIYUNJI Disaster Prevention Research Institute Professor, IGARASHI AKIRA Graduate School of Engineering Associate Professor, FURUKAWA AIKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course deals with the mechanism and propagation characteristics of the seismic ground motion that often greatly affects the urban society, in particular the wave generation in the earthquake fault and the ground vibration analysis, and the elastic and elastoplastic response of the structures to the seismic ground motions. The topics include the dynamic response characteristics of RC/steel structures, current seismic response control technology, basic theory and technical development of lifeline earthquake engineering, thoretical aspect of lifeline management and safety assessment learned from past damage experience.					
<b>[Course objectives]</b>					
This course aims to provide students with the knowledge to comprehensively understand the flow from the mechanism of earthquake occurrence and wave generation to ground motions and seismic characteristics of structures including lifelines, as well as to acquire advanced earthquake-resistant technologies and risk management methods for lifeline systems.					
<b>[Course schedule and contents]</b>					
Principles of seismic design of structures, 2 times					
Earthquake faults and seismic mechanisms, 1 time					
Body wave and surface wave, 1 time					
Fundamental theory on ground response analysis, 1 time					
Fundamental theories on dynamic response of nonlinear elastoplastic structural systems and representative seismic design principles, 2 times					
Seismic performance and seismic design of concrete structures, 1 time, Essentials and current issues related to seismic performance and design of RC structures					
Seismic response control and seismic retrofit of structures, 1 time, Idea and current issues on seismic isolation, seismic response control techniques for enhancement of seismic performance of structures, and seismic retrofit and rehabilitation of existing structures					
Earthquake resistance of foundations and structures, 1 time,					
Earthquake resistance of underground structures ,2 times,					
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Continue to 地震・ライフライン工学(2)					

## 地震・ライフライン工学(2)

Earthquakes and Lifelines,1 time,

Earthquake Risk Management for Lifelines,1 time,

Achievement evaluation,1 time, achievements in understanding of the course material are evaluated.

### [Course requirements]

None

### [Evaluation methods and policy]

Attendance, assignments, etc. (about 50% of the points), and the final report (about 50% of the points) will be comprehensively taken into account in the evaluation.

### [Textbooks]

Not specified

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Instructions will be given as appropriate.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG02 7F263 LJ73 G-ENG01 7F263 LJ73				
<b>Course title (and course title in English)</b>	サイスミックシミュレーション Seismic Engineering Exercise		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor, SAWADA SUMIO Graduate School of Engineering Professor, TAKAHASHI YOSHIKAZU Disaster Prevention Research Institute Associate Professor, GOTOU HIROYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course provides the knowledge of simulation methods for earthquake engineering. Small groups of students are exercised in the prediction of ground motion generated by a specified seismic fault and the response analysis of structure selected by themselves considering soil-structure interaction.					
<b>[Course objectives]</b>					
At the end of this course, students will be required to have a good understanding of: - Prediction of ground motion generated by a specified seismic fault - Dynamic response analysis of structures and foundation (linear/nonlinear)					
<b>[Course schedule and contents]</b>					
<p>1. Frequency domain analysis Basics of Fourier transformation is introduced.</p> <p>2. Modeling of structure - soil system and time domain analysis Equation of motion of SR model is introduced and the integration method of the equation in time domain is explained.</p> <p>3-4. Exercise of linear seismic response analysis Small groups of students are exercised in elastic modeling of structures and linear response analysis in time domain and frequency domain.</p> <p>5-7. Prediction of ground motion by empirical Green's function method Empirical Green's function method is introduced to predict large earthquakes based on observed small earthquakes.</p> <p>8-9. Seismic analysis method of soil Seismic analysis method of layered half-space based on equivalent linearization method is introduced.</p> <p>10-11. Nonlinear seismic analysis method of structures Nonlinear modeling of structures and the integration and iterative methods of the nonlinear equation of motion in time domain are introduced.</p> <p>12-14. Exercise of nonlinear seismic response analysis Small groups of students are exercised in the prediction of ground motion generated by a specified seismic fault and the nonlinear response analysis of structures and foundation.</p>					
----- Continue to サイスミックシミュレーション(2) -----					

## サイスミックシミュレーション(2)

### 15. Achievement Check

All students give presentations and discussions.

### **[Course requirements]**

Earthquake Engineering/Lifeline Engineering (10F261), Structural Dynamics (10F227)

### **[Evaluation methods and policy]**

Based on the performance during the course (including homework) and the results of presentation and reports.

### **[Textbooks]**

Not used; Class hand-outs are distributed when necessary.

### **[References, etc.]**

( Reference books )

### **[Study outside of class (preparation and review)]**

Students require to review and analyze in preparation for final presentations.

### **( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>		G-ENG01 7F269 LJ24			
<b>Course title (and course title in English)</b>	沿岸・都市防災工学 Coastal and Urban Water Disasters Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor,HIRAISHI TETSUYA Disaster Prevention Research Institute Professor,IGARASHI AKIRA Disaster Prevention Research Institute Professor,MORI NOBUHITO Disaster Prevention Research Institute Associate Professor,YONEYAMA NOZOMU Disaster Prevention Research Institute Associate Professor,SHIMURA TOMOYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The coastal and densely populated urban areas with highly concentrated economic and social activities and infrastructures are exposed to the threat of coastal disasters such as tsunamis, storm surges, high waves, urban flood damage and urban earthquake disasters caused by particular conditions associated with their characters. This course provides the factors, examples and characteristics of coastal and urban regional disasters, as well as disaster prevention measures taking these factors into consideration.					
<b>[Course objectives]</b>					
In-depth understanding of concepts and knowledge necessary for taking measures against disasters, based on fundamental theories of hydraulics and structural mechanics, occurrence, propagation and deformation of external actions caused by coastal and urban earthquake disasters, as well as information on the past disaster and damage examples.					
<b>[Course schedule and contents]</b>					
Outline of coastal and urban disasters (1 week) Introduction of coastal and urban disasters will be lectured. The type and cause of coastal and urban disasters will be explained for sequential lectures.					
Modeling of tsunami, storm surge and waves (3 weeks) The fundamental physics and governing equations of tsunami, storm surge and ocean waves will be described and applications and historical events will be explained in detail.					
Reduction of coastal disasters (3 weeks) Characteristics of historical tsunamis, storm surges and coastal erosion will be presented with countermeasures by engineering approaches. Reliability design for coastal structures will be explained following Japanese standard.					
Earthquake disaster in urban areas (1 week) Review of recent earthquake disasters in urban areas in Japan and other countries					
Prediction of regional damage due to earthquake and tsunami (3 weeks) Fundamental principles of regional damage prediction for scenario earthquakes and tsunami events					
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Continue to 沿岸・都市防災工学(2)					

## 沿岸・都市防災工学(2)

Countermeasures for urban flood (1 week)

Elucidation of urban flood phenomena using numerical analysis (2 weeks)

Achievement Evaluation (1 week)

Submission of reports to integrate the idea of prevention and reduction of coastal and urban disasters, to evaluate students' achievements in understanding of the course material.

### [Course requirements]

None

### [Evaluation methods and policy]

Grading will be based on the report and achievements in the class.

### [Textbooks]

Not specified. Hand-outs and research papers are distributed when necessary.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

The methodology and idea developed in the lecture should be explored by relating your own field of research.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 7F380 LE77			
<b>Course title (and course title in English)</b>	強靱な国づくりのためのエンジニアリングセミナー Engineering Seminar for Disaster Resilience in ASEAN countries		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TACHIKAWA YASUTO Graduate School of Engineering Associate Professor, MATSUSHIMA KAKUYA Graduate School of Engineering Professor, ICHIKAWA YUTAKA Graduate School of Engineering Professor, SUSAKI JUNICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The purpose of this course is to provide practical lessons in ASEAN countries associated with disaster risk mitigation such as early warning and evacuation program, and disaster recovery/restoration from viewpoints of problems-finding/problem-solving through short term intensive lecture and field work. By taking the applied practical programs of shared major classes under the instructions of teachers in charge, the students can improve the ability of resolving issues on practical projects. Topics taught in this seminar are earthquake, flood, landslide, land subsidence, and geo-risk engineering.					
<b>[Course objectives]</b>					
Course aims to foster international leaders who are able to solve and manage problems concerned about natural disaster, disaster mitigation, health and environmental issues, especially about case studies in ASEAN countries.					
<b>[Course schedule and contents]</b>					
Introduction: Engineering for Disaster Resilience, 1time, Earthquake Disaster, 2times, Landslide Disaster, 2times, Geo-Risk Engineering, 2times, Flood Disaster, 2times, Land Subsidence, 2times, Site Visit, 5times, Evaluation of understanding, 1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
40% for course work assignments and reports, 60% for final exam.					
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Continue to 強靱な国づくりのためのエンジニアリングセミナー(2)					

強靱な国づくりのためのエンジニアリングセミナー(2)

**[Textbooks]**

Lecture notes provided by the instructors.

**[References, etc.]**

( Reference books )

( Related URLs )

(Consortium for International Human Resource Development for Disaster-Resilient Countries, Kyoto University <http://www.drc.t.kyoto-u.ac.jp/rsdc/eng/>)

**[Study outside of class (preparation and review)]**

( Other information (office hours, etc.) )

Those who want to take this course have to apply for Study area of Approaches for Disaster Resilience. Refer the website above.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 6F405 LE73 G-ENG02 6F405 LE73			
<b>Course title (and course title in English)</b>	ジオフロント工学原論 Fundamental Geofront Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MIMURA MAMORU Graduate School of Management Professor,HIGO YOUSUKE Graduate School of Engineering Professor,KIMURA MAKOTO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course deals with near-surface quaternary soft soil deposits that are the most important in the engineering sense. Physical properties and the mechanical characteristics of partially saturated and fully saturated soils are explained, and then various problems in terms of disaster prevention and infrastructure construction are discussed.					
<b>[Course objectives]</b>					
The aim of this course is to understand engineering problems and their mechanical background in the following points: - Physical properties and mechanical characteristics of quaternary soft soil deposits and relevant engineering problems in terms of disaster prevention - Fundamentals of unsaturated soil mechanics and engineering problems of earth structures in terms of disaster prevention - Concepts of innovative underground foundations and structures and engineering problems during construction					
<b>[Course schedule and contents]</b>					
Outline of the course, introduction to quaternary deposits, 1time, Introduction to quaternary deposits. Types and mechanisms of geotechnical disasters relevant to quaternary deposits.					
Geo-informatic database, 1 time, Geo-informatic database and its application to modelling soft alluvial soils, liquefaction hazard map, etc.					
Evaluation of subsurface structure based on GID, 1 time, Scheme to evaluate subsurface structures using Geo-informatic database including boring logs, geophysical exploration, geological structures. Application to Kyoto basin is given.					
Evaluation of liquefaction for near-surface sand deposits, 1 time, Evaluation of liquefaction for near-surface sand deposits using Geo-informatic database is explained. Applications to the 1995 Hyogo-ken Nanbu Earthquake and the 2011 Off the Pacific Coast of Tohoku Earthquake are given, through which open questions are discussed.					
Problems of soft clay deposits, 1 time, Deformation characteristics and stability of soft clay deposits and their evaluation methods are explained, e.g., effectiveness and limitation of ground improvement, long term settlement problem, and case histories of large scale reclamation.					
Concept of innovative underground structures, 1 time, Citizen-participate-type renovation technique for					
----- Continue to ジオフロント工学原論(2)					

## ジオフロント工学原論(2)

unpaved roads using sandbags.

Concept of innovative underground structures, 1 time, New construction method of embankments using consecutive precast arch culvert.

Concept of innovative underground structures, 2 times, Technical problems of steel pipe sheet pile. Development of consecutive steel pipe sheet pile and its application.

Outline of earth structures, Unsaturated soil mechanics, 2 times, Roles of earth structures as an infrastructure. Unsaturated soil mechanics.

Damage of earth structures caused by rainfall and earthquake, 1time, Case examples and their mechanisms of the damages of earth structures caused by rainfall and earthquake.

Methods to evaluate and improve stability of earth structures subjected to rainfall and earthquake, 1 time, Design methods of earth structures and their problems are outlined.

Site visit, 1 time, Visit construction site relevant to the issues of this course.

Evaluation and feedback, 1 time, Evaluation of achievement by examination, and its feedback.

### [Course requirements]

Undergraduate courses in geology, geotechnical engineering, and soil mechanics are desired.

### [Evaluation methods and policy]

Performance grading will be provided based on examination. Attendance and quality of assigned reports, etc. are considered.

The grade will be based on roughly 50% and 50% on examination and others, respectively.

### [Textbooks]

Handouts will be distributed.

### [References, etc.]

#### ( Reference books )

References are indicated in the handout.

### [Study outside of class (preparation and review)]

Fundamental knowledge of soil mechanics

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

Continue to ジオフロント工学原論(3)

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<b>Course number</b>		G-ENG02 5F415 LJ73    G-ENG01 5F415 LJ73			
<b>Course title (and course title in English)</b>	環境材料設計学 Ecomaterial Design		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Management Professor, YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor, TAKAYA SATOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Lecture on outline of impact of construction materials to environment and influence on materials and structures from environment. Discuss how to use materials sustainably. Keywords are concrete, steel, composite materials, CO2, durability, recycle and reuse, life-cycle assessment.					
<b>[Course objectives]</b>					
To understand the limit of resources and effect of material use to environment. and to understand the basic theory to make environmental-friendly infrastructures from the view point of materials use.					
<b>[Course schedule and contents]</b>					
Guidance, 1 time, Object of the Course, Grading and Goals product of materials and impact to environment, 1 time, Product of cement, steel, concrete CO2 product and its influence recycle and reuse of materials, 3 times, Recycle and reuse of steel, metals, concrete, asphalt, plastics Technology development of construction materials deterioration of concrete structures, 1 time, Mechanism of deterioration of concrete structures: carbonation, salt attack, alkali-aggregate reaction Maintenance and retrofit methods deterioration of steel structures, 1 time, Mechanism of deterioration of steel structures: corrosion, fatigue Maintenance and retrofit methods deterioration of composite structures, 1 time, Mechanism of deterioration of composite structures: Maintenance and retrofit methods life-cycle assessment of structures, 1 time, Life-cycle assessment of structures considering initial cost as well as maintenance cost topics and discussion, 2 times, Recent topics on construction materials and discussion presentation by students and discussion / feedback, 4 times, Presentation by students on the individual topics Discussion on the topics. Feedback at the last class					
<b>[Course requirements]</b>					
Basic knowledge of construction materials, concrete engineering					
<b>[Evaluation methods and policy]</b>					
Reports (60%) and mini quizzes (40% including attendance) will be assigned, and the overall score will be judged.					
<div style="text-align: right;">Continue to 環境材料設計学(2)</div>					



## 環境材料設計学(2)

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### [Textbooks]

No set text

### [References, etc.]

#### ( Reference books )

Instructed in class

### [Study outside of class (preparation and review)]

Check the handouts. Additional studies will also be instructed.

### ( Other information (office hours, etc.) )

Questions and discussions are welcome

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG02 7F464 LJ73    G-ENG01 7F464 LJ73			
<b>Course title (and course title in English)</b>	水工計画学 Hydrologic Design and Management		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Professor,ICHIKAWA YUTAKA Graduate School of Global Environmental Studies Assistant Professor,田中 智大	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Hydrologic design and real-time rainfall-runoff prediction methods are described. The frequency analysis of hydrologic extreme values and the time series analysis of hydrologic variables are described, and then a procedure to determine an external force for the hydrologic design are explained. Next, a physically based hydrologic model which includes various processes of human activities for the hydrologic cycle is described. A flood control planning and water resources management with the use of innovative hydrologic simulation tools is described. Then, A real-time rainfall runoff prediction method with the use of Kalman filter theory is described.</p>					
<b>[Course objectives]</b>					
<p>The class aims to understand the probabilistic and statistical analysis of hydrologic variables to determine the external force of hydrologic designs, applications of hydrologic simulations for hydrologic designs, and real-time rainfall and runoff prediction methods for water resources management.</p>					
<b>[Course schedule and contents]</b>					
<p>Introduction,1time,A flood control planning and water resources planning are introduced.  Frequency analysis and hydrologic design,3times,The frequency analysis of hydrologic extreme values is described. The methods to set the external force for the hydrologic design are explained.  Time series analysis and hydrologic design,2times,The time series analysis of hydrologic variables is described. The methods to develop time series models, time serried data generation methods, spatiotemporal variation of hydrologic variables and a random field model, disaggregation methods are explained.  Hydrologic modeling and predictive uncertainty ,2times,Hydrologic models which include the process of human activities for the hydrologic cycle is described. Then, hydrologic predictive uncertainty is explained, which is inevitable coming from model structure uncertainty, parameter identification uncertainty and model input uncertainty. Especially, the relation between spatiotemporal scales of hydrologic modeling and model parameter values is described.  Hydrologic modeling system,2times,A hydrologic modeling system which helps to develop complicated hydrologic simulation models and its importance for a flood control planning is also described.  Watershed management for flood disaster,2times,Watershed management to mitigate flood disasters is described. A cost-benefit analysis of flood control measures is discussed.  Real-time rainfall runoff prediction,2times,A real-time rainfall runoff prediction method with the use of Kalman filter theory and a new filter theory is described.  Feedback of study achievement,1time,Feedback of study achievement is conducted.</p>					
Continue to 水工計画学(2)					

## 水工計画学(2)

### [Course requirements]

Basic knowledge of hydrology, probability and statistics are required.

### [Evaluation methods and policy]

Final report (100)

### [Textbooks]

### [References, etc.]

( Reference books )

( Related URLs )

(<http://hywr.kuciv.kyoto-u.ac.jp/lecture/lecture.html>)

### [Study outside of class (preparation and review)]

Read the textbook and/or related documents in advance and work on assignments to improve understanding of the lecture contents.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 5F466 LJ16 G-ENG02 5F466 LJ16			
<b>Course title (and course title in English)</b>	流域環境防災学 Disaster Mitigation for Sustainable Basin Environment		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor,FUJITA MASA HARU Disaster Prevention Research Institute Professor,HIRAISHI TETSUYA Disaster Prevention Research Institute Associate Professor,TAKEMON YASUHIRO Disaster Prevention Research Institute Associate Professor,BABA YASUYUKI Disaster Prevention Research Institute Assistant Professor,MIYATA SYUUSUKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In a concept of the environmental disaster prevention, an idea that the disaster prevention could provide continuously the environmental benefits is contained as well as an idea of preventing the environmental deterioration. In this lecture, an environment system formation function of a debris flow, a flood, an ocean wave is explained. Also their values as natural resources are discussed. The influence of structural countermeasures on the environment conservation is evaluated from this point of view. A new idea of disaster prevention is introduced considering the function of the natural impacts and the value of the natural phenomena as resources is discussed. Also a new method for basin management is introduced.					
<b>[Course objectives]</b>					
The course goal is to understand a concept of the basin management balanced between disaster prevention and environment conservation based on the sediment transport hydraulics and the ecology.					
<b>[Course schedule and contents]</b>					
<p>Week1-3:Introduction of the environmental disaster prevention</p> <p>First of all, a concept of the environmental disaster prevention is introduced. The utilization of flood plains as agricultural land and the history of rivers with bed above ground and so on are introduced, and the relation between the human being and rivers is explained. A method to balance the sustained resources use with disaster prevention is discussed.</p> <p>Week4-6: Basin scale ecosystem function</p> <p>A role of the disturbance in maintaining of the structure and function of the basin scale ecosystem is explained. For example, a role of the natural phenomenon such as a debris flow, a flood inundation is explained.</p> <p>Week7-10:Coastal disasters and environment</p> <p>The actual situation of the coastal erosion in our country and the causes are explained. Then, the problems on disaster prevention, environment conservation and utilization in coastal areas are introduced. Technology development to solve these problems is introduced. Also, the relation between environment in river mouth and river basin is discussed.</p> <p>Week 11-12:Sediment disasters and environment</p> <p>Sediment hazards give a big impact to river environment as well as the human beings. As one of the</p>					
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Continue to 流域環境防災学(2)					

## 流域環境防災学(2)

sediment hazards landslides are taken up and the occurrence mechanism is explained.

Week 13-14: Sediment management with consideration of environment conservation

The basin scale sediment management is carried out for the purpose of safety, appropriate utilization and environmental conservation. Actual sediment management and the related researches are introduced. A concept, new ideas and new technology are discussed.

Week 15:Feed back

Evaluation of proficiency level, 1 times,Students confirm the proficiency level in this lecture.

### [Course requirements]

Hydraulics, River Engineering, Coastal Engineering, Sediment Transport Hydraulics, Ecology

### [Evaluation methods and policy]

Presentation, Discussion and Report

### [Textbooks]

Not use textbooks, but distribute papers and reports if necessary.

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Review the contents of the lecture thoroughly. Study widely river ecosystem and natural disasters.

### ( Other information (office hours, etc.) )

This lecture is open every 2 years and open in 2022.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 6K016 LE73   G-ENG02 6K016 LE73			
<b>Course title (and course title in English)</b>	計算地盤工学 Computational Geotechnics		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor, UZUOKA RYOSUKE Graduate School of Engineering Associate Professor, SAWAMURA YASUO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The course provides students with the numerical modeling of geomaterials to predict the mechanical behavior of geomaterials. The course will cover the governing equations for multiphase geomaterials based on the theory of porous media. The fundamental constitutive models of geomaterials including the elastic model, the elastoplastic models will also be presented. In addition, numerical methods including FEM and FDM will be explained with some applications, such as, consolidation, soil-structure interaction problems. Finally, students are required to do excises of numerical calculations.					
<b>[Course objectives]</b>					
Understanding the numerical modeling of multiphase geomaterials					
<b>[Course schedule and contents]</b>					
<b>【Introduction】</b> （ 1time ） Guidance and introduction to computational geomechanics  <b>【Governing equations】</b> （7 times） Fundamental concept in continuum mechanics such as deformation, stresses, and motion. Governing equations for fluid-solid two-phase materials: Conservation of mass, balance of linear momentum. Constitutive models for soils, including elastic model, elastoplastic model (Cam-clay model), elasto-viscoplastic model.  <b>【Numerical methods and applications】</b> （4 times） Numerical methods (FEM, FDM etc.) Applications of finite element method  <b>【Exercises】</b> （3 times） FEM analysis for two-phase mixture Exercises and interpretations of the results Presentation					
<b>[Course requirements]</b>					
Understanding on fundamental geomechanics					
Continue to 計算地盤工学(2)					

## 計算地盤工学(2)

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### [Evaluation methods and policy]

Assignments in every class (100%)

### [Textbooks]

Handout will be given.

### [References, etc.]

( Reference books )

Handout will be given.

### [Study outside of class (preparation and review)]

Handout will be given through ‘ PandA ’ .

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG01 5W001 LE73    G-ENG02 5W001 LE73			
<b>Course title (and course title in English)</b>	社会基盤構造工学 Structural Engineering for Civil Infrastructure		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor,FURUKAWA AIKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Structural engineering problems related to planning, design, construction and maintenance of the infrastructures are discussed. Topics concerning structural engineering and management are widely taken up including latest advanced knowledge and technology, future view and/or international topics. Special lectures by extramural lecturers are carried out if necessary.					
<b>[Course objectives]</b>					
To grasp problems related to structural engineering and their specific solutions. To understand applicability of advanced technologies and development prospects.					
<b>[Course schedule and contents]</b>					
Structural Materials, Structural Mechanics,4times,Steel materials, Concrete materials, mechanical behavior of structures, Problems related to design, construction and maintenance Applied Mechanics,1time,Numerical analysis for structure performance evaluation Earthquake and Wind Resistance of Structures,7times,Infrastructure and natural disaster, Trends of disaster prevention technology, Problems related to Earthquake and wind resistant design Maintenance of structure,3times,International technology, Scenario design, International technological education and collaboration					
<b>[Course requirements]</b>					
Structural Mechanics, Wind Resistant Design, Construction Materials, Dynamics of Structures, etc.					
<b>[Evaluation methods and policy]</b>					
Coursework will be graded based on the reports.					
<b>[Textbooks]</b>					
The textbook is not required. Materials will be supplied by instructors.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Supplemental text books will be introduced by instructors.					
<b>[Study outside of class (preparation and review)]</b>					
To review today's topics.					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>		G-ENG01 7X311 LE77			
<b>Course title (and course title in English)</b>	都市基盤マネジメント論 Urban Infrastructure Management		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KISHIDA KIYOSHI Graduate School of Engineering Professor,KIMURA MAKOTO Graduate School of Engineering Professor,KIYONO JIYUNJI Graduate School of Engineering Associate Professor,QURESHI , Ali Gul Graduate School of Engineering Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Professor,MIMURA MAMORU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This lecture aims to provide interdisciplinary knowledge associated with how urban infrastructure is comprehensively management, from viewpoints of not only economy but also "human security engineering". In detail, the contents of lectures consist of following topics: Urban Infrastructure Asset Management, Urban Disaster Risk Mitigation Management, Urban Transport/Logistics Management and Urban Food/Water Supply Management.					
<b>[Course objectives]</b>					
Aquisition of interdisciplinary knowledge associated with how urban infrastructure is comprehensively management, from viewpoint of not only economy but also human security engineering.					
<b>[Course schedule and contents]</b>					
Guidance, Introduction of Urban Infrastructure Asset Management,1time					
Guidance amp Introduction to Urban Infrastructure Asset Management Urban Infrastructure Asset Management,4times					
Urban Infrastructure Asset Management on Geotechnical structures and Bridge Urban Disaster Risk Mitigation Management ,3times					
Urban Disaster Risk Mitigation Management Urban Food/Water Supply Management ,3times					
Urban Food/Water Supply Management Urban Transport/Logistics Management,2times					
Urban Transport/Logistics Management Report,1time					
Report					
----- Continue to 都市基盤マネジメント論(2) -----					

## 都市基盤マネジメント論(2)

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Feed back,1time

### [Course requirements]

None

### [Evaluation methods and policy]

Attendance(20), Report(80)

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

Hand-out

### [Study outside of class (preparation and review)]

Work on Assignments

### ( Other information (office hours, etc.) )

Additional information is available by visiting the following professors. Appointment shall be made in advance by e-mail.

ohtsu.hiroyasu.6n@kyoto-u.ac.jp

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 5X333 LE24				
<b>Course title (and course title in English)</b>	災害リスク管理論 Disaster Risk Management		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor,TATANO HIROKAZU Disaster Prevention Research Institute Associate Professor,SAMADDAR , Subhajyoti Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Natural disasters have low frequencies but high impacts. It is very important to make an integrated risk management plan that consists of various countermeasures such as prevention, mitigation, transfer, and preparedness. This class will present economic approaches to natural disaster risk management and designing appropriate countermeasures.					
<b>[Course objectives]</b>					
Students are expected to understand fundamental ways of economic analyses of disaster prevention such as economic valuation of disaster losses, decision making principle under risks, derivation of benefits of risk management.					
<b>[Course schedule and contents]</b>					
Introduction to disaster risk management,1time,Introduction and Explanation of Course Outline, The Global Trends of Natural Disasters 1. Decision making theory under uncertainty,1time,Bayes#039 theorem, Expected utility function Methods of disaster risk management,1time,Risk control and risk finance Economic valuation of catastrophic risk mitigation,1time,Cost-Benefit analysis, conventional valuation method, catastrophic risks and economic valuation of disaster mitigation Risk perception bias, land-use and risk communication,2times,Risk perception bias, land-use model, risk communication Disaster risk finance,2times,Recent issues of risk finance market, reinsurance, CAT bond, roles of government, derivatives Risk curve and risk assessment,1time,Fragility curve and risk assessment General equilibrium analysis under disaster risk,1time,General equilibrium model under disaster risk Macrodynamics under disaster risk,1time,GDP, economic growth Disaster accounting,1time,Accounting systems Exercise and presentation,2times,Students#039 exercise and presentation Confirmation of the learning achievement degree,1time,Confirmation of the learning achievement degree					
<b>[Course requirements]</b>					
Nothing					
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Continue to 災害リスク管理論(2)					

## 災害リスク管理論(2)

### [Evaluation methods and policy]

Evaluate mainly by the presentations in the class as well as end-of-term report, taking active and constructive participation in the class into account.

### [Textbooks]

Tatano,H., Takagi,A.(ed.):Economic Analysis of disaster prevention, Keiso pub.,2005 (in Japanese).

### [References, etc.]

#### ( Reference books )

Froot ,K.A.(ed) "The Financing of Catastrophic Risk", the University of Chicago Press  
Kunreuther H. and Rose, A., "The Economics of Natural Hazards", Vol.1 and 2, The International Library of Critical Writings in Economics 178, Edward Elgar publishers, 2004  
Okuyama, Y., and Chang, S.T.,(eds.) "Modeling Spatial and Economic Impacts of Disasters" (Advances in Spatial Science), Springer, 2004.

#### ( Related URLs )

(No web site)

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 7F063 PJ58					
<b>Course title (and course title in English)</b>	社会基盤工学実習 Practice in Infrastructure Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
To develop fundamental and practical understandings on Civil and Earth Resources Engineering and cultivate problem-solving abilities, students are encouraged to attend a practical education and engineering program offered by educational institutes such as universities, international and domestic associations. Students attend a program under the instructions of academic supervisors. Programs are limited to the ones certified by the department.						
<b>[Course objectives]</b>						
To develop fundamental and practical understandings on Civil and Earth Resources Engineering and cultivate problem-solving abilities by attending a practical education and engineering program offered by educational institutes such as universities, international and domestic associations.						
<b>[Course schedule and contents]</b>						
all, 1time, study practical knowledge. , 5times, , 6times, , 3times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Attendance and reports are comprehensively evaluated.						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG31 7U051 SE58				
<b>Course title (and course title in English)</b>	社会基盤工学総合セミナー A Integrated Seminar on Infrastructure Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor, HARADA EIJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
On the investigation of themes by the students, they make the presentation and discussion in English. The themes are about the technology innovation of infrastructure on the international viewpoint, the ideal style of infrastructure management, the standardization of project technology for internationalization, and about the technology movement or the role of Japan in the world on the construction of infrastructure and the usage of resource energy such as the development and utilization of international crust or resource energy.					
<b>[Course objectives]</b>					
Goals are to cultivate students' ability for discussing research topic in English.					
<b>[Course schedule and contents]</b>					
Guidance, 1 time, Preparation for presentation, 2 times, Presentation on research and discussion, 10 times, Submission of presentation materials, 2 times.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluation for each student is made comprehensively based on presentation, discussion and participation in the classroom.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) None					
<b>[Study outside of class (preparation and review)]</b>					
Review the presentation contents in the seminar.					
<b>( Other information (office hours, etc.) )</b>					
Details will be provided in the guidance and first lecture.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG31 7U052 SE58				
<b>Course title (and course title in English)</b>	社会基盤工学総合セミナー B Integrated Seminar on Infrastructure Engineering B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
On the investigation of themes by the students, they make the presentation and discussion in English. The themes are about the technology innovation of infrastructure on the international viewpoint, the ideal style of infrastructure management, the standardization of project technology for internationalization, and about the technology movement or the role of Japan in the world on the construction of infrastructure and the usage of resource energy such as the development and utilization of international crust or resource energy.					
<b>[Course objectives]</b>					
Goals are to cultivate students' ability for discussing research topic in English.					
<b>[Course schedule and contents]</b>					
Guidance,1time, Preparation for presentation,2times, Presentation on research and discussion,10times, Submission of presentation materials,2times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluation for each student is made comprehensively based on presentation, discussion and attendance.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Review the presentation contents in the seminar.					
<b>( Other information (office hours, etc.) )</b>					
Details will be provided in the guidance and first lecture.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG01 7U055 PJ58				
<b>Course title (and course title in English)</b>	社会基盤工学セミナーA Seminar on Infrastructure Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This lecture focuses on the movement and content of the most advanced research at home and abroad on Infrastructure Engineering. The students are individually instructed about the planning of study schedule, the way of collecting data, the way of doing the research and summarizing the results of research.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,6times, ,8times, ,6times, ,8times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<p>Points are allocated for research activities such as a presentation at laboratory seminars, domestic conferences, international conferences, research paper presentation etc. Students are required to obtain the points in total which are more than predefined points.</p> <p>Students are required to get no less than 10 points in total for two years from M1 to M2, no less than 3 points in each year.</p> <p>1 point: Presentation at laboratory seminar (only if supervisor agrees), oral presentation in the annual meeting in the Society of Civil Engineers.</p> <p>1 ~ 5 point: Attending the lecture held by Academic Society (Certification is required), number of points is determined by your supervisor in accordance to the level of difficulty for approval.</p> <p>3 point : Presentation in English in international conference. If the papers are peer-reviewed, the points are determined as journal papers (see below).</p> <p>5 ~ 10 point: First author or coauthor of published and/or accepted journal papers (e.g., for Journal of Society of Civil Engineers, ASCE Journal, etc.) (Number of points is determined by your supervisor depending on level of journal and/or your contribution.)</p> <p>Others: Exercise on project or training course (Number of points is determined by your supervisor). However, the activities related to the other courses are not admitted, which are Exercise on Project Planning, Capstone</p>					
Continue to 社会基盤工学セミナーA(2)					



## 社会基盤工学セミナーA(2)

Project, Internship on Infrastructure Engineering, Long-Term Internship, Practice in Infrastructure Engineering or Practice in Urban Management.

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 7U056 PJ58				
<b>Course title (and course title in English)</b>	社会基盤工学セミナーB Seminar on Infrastructure Engineering B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The students make the collection of data, study and summarize the research results about the specific themes on Infrastructure Engineering. In addition, the students are individually instructed about the way of presentation of research results through the presentations at the conferences at home and abroad, the ones at laboratory and participation in training course.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
all, 2 times, Each supervisor navigates students thorough their presentations and discussion. , 6 times, , 8 times, , 6 times, , 8 times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<p>Points are allocated for research activities such as a presentation at laboratory seminars, domestic conferences, international conferences, research paper presentation etc. Students are required to obtain the points in total which are more than predefined points.</p> <p>Students are required to get no less than 10 points in total for two years from M1 to M2, no less than 3 points in each year.</p> <p>1 point: Presentation at laboratory seminar (only if supervisor agrees), oral presentation in the annual meeting in the Society of Civil Engineers.</p> <p>1 ~ 5 point: Attending the lecture held by Academic Society (Certification is required), number of points is determined by your supervisor in accordance to the level of difficulty for approval.</p> <p>3 point : Presentation in English in international conference. If the papers are peer-reviewed, the points are determined as journal papers (see below).</p> <p>5 ~ 10 point: First author or coauthor of published and/or accepted journal papers (e.g., for Journal of Society of Civil Engineers, ASCE Journal, etc.) (Number of points is determined by your supervisor depending on level of journal and/or your contribution.)</p> <p>Others: Exercise on project or training course (Number of points is determined by your supervisor). However,</p>					
Continue to 社会基盤工学セミナーB(2)					

## 社会基盤工学セミナーB(2)

the activities related to the other courses are not admitted, which are Exercise on Project Planning, Capstone Project, Internship on Infrastructure Engineering, Long-Term Internship, Practice in Infrastructure Engineering or Practice in Urban Management.

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 8U059 PJ58				
<b>Course title (and course title in English)</b>	社会基盤工学インターンシップ Internship on Infrastructure Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Through the long-term internship outside the university, the students can get the practical techniques, the way of finding and solving the problems, the way of integrating the techniques, the way of summarizing the results and making the presentation in each field of infrastructure engineering.					
<b>[Course objectives]</b>					
The students can understand research trend, society's needs, and their aptitude, through long-term job experiences linked with future career.					
<b>[Course schedule and contents]</b>					
Course introduction: 1 time Preparation for internship: 5 times Implementation of internship: 14 times (longer than 3 months between August and December) Preparation of final report: 8 times Presentation: 2 times					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Writing plans, completing internship, final report and presentation are comprehensively evaluated.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Details are provided in the course.					
<b>( Other information (office hours, etc.) )</b>					
Details are provided in the first lecture.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG31 7U060 PB58				
<b>Course title (and course title in English)</b>	社会基盤工学 O R T ORT on Infrastructure Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
By practicing about the research themes on Infrastructure Engineering and making the presentations of the research results at the conferences, the students can develop the advanced specialities and the ability of finding out the new fields of research. Also, the students get the practical ability which is necessary for researchers and engineers. The students can participate in the conferences at home and abroad, in the presentations of research at laboratory, in some kinds of seminars, symposiums, lecture classes, internship to the enterprises or research organizations at home and abroad. The director of the department and the supervisor totally evaluate the reports made about these activities by the students.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,6times, ,8times, ,6times, ,8times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
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Continue to 社会基盤工学 O R T (2)					

## 社会基盤工学O R T (2)

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

Details will be provided in the guidance.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG31 7U064 PB58				
<b>Course title (and course title in English)</b>	社会基盤工学総合実習A Practice in Advanced Infrastructure Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,5times, ,2times, ,5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG31 7U065 PB58					
<b>Course title (and course title in English)</b>	社会基盤工学総合実習B Practice in Advanced Infrastructure Engineering B			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,3times, ,5times, ,2times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG02 8F150 PJ58				
<b>Course title (and course title in English)</b>	長期インターンシップ Long-Term Internship		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Through the long-term internship outside the university, the students can get the practical techniques, the way of finding and solving the problems, the way of integrating the techniques, the way of summarizing the results and making the presentation in each field of urban management.					
<b>[Course objectives]</b>					
The students can understand research trend, society's needs, and their aptitude, through long-term job experiences.					
<b>[Course schedule and contents]</b>					
Course introduction: 1 time Preparation for internship: 5 times Implementation of internship: 14 times (longer than 3 months between August and December) Preparation of final report: 8 times Presentation: 2 times					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Writing plans, completing internship, final report and presentation are comprehensively evaluated.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Details are provided in the course.					
<b>( Other information (office hours, etc.) )</b>					
Details are provided in the first lecture.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG02 8F253 PJ58					
<b>Course title (and course title in English)</b>	キャップストーンプロジェクト Capstone Project		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, MATSUNAKA RYOUJI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English	
<b>[Overview and purpose of the course]</b>						
The students plan and implement projects on various problems in the urban society by widely making use of the basic knowledge which you have gotten in Undergraduate or Master Course. Actually, the students simulate the actual problems for which you collect and analyze the data, and then evaluate the practice and effect of projects. At the end, the students write the reports about a series of project results and make the presentations about them.						
<b>[Course objectives]</b>						
Goals are to cultivate students' ability for planning, creativity and communication.						
<b>[Course schedule and contents]</b>						
Guidance, 1time, Plan projects, 4times, Implement projects, 6times, Analyze and evaluate projects, 12times, Discuss results, 6times, Presentation, 1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Evaluation for each student is made comprehensively based on both report and presentation about the project, and usual contribution of student to the project.						
<b>[Textbooks]</b>						
Non						
<b>[References, etc.]</b>						
<b>( Reference books )</b>						
Non						
<b>[Study outside of class (preparation and review)]</b>						
Examine the project theme.						
<b>( Other information (office hours, etc.) )</b>						
Details will be provided in the first lecture.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG02 7F257 SJ58				
<b>Course title (and course title in English)</b>	都市社会工学セミナーA Seminar on Urban Management A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This seminar has the lectures about the movement and content of the most advanced research at home and abroad on Urban Management Engineering.. Also, the teachers in this seminar instruct the students individually about the planning of study schedule, the way of collecting datas, doing the research and summarizing the results of research on the concrete and specific themes.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,6times, ,8times, ,6times, ,8times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<p>Points are allocated for research activities such as a presentation at laboratory seminars, domestic conferences, international conferences, research paper presentation etc. Students are required to obtain the points in total which are more than predefined points.</p> <p>Students are required to get no less than 10 points in total for two years from M1 to M2, no less than 3 points in each year.</p> <p>1 point: Presentation at laboratory seminar (only if supervisor agrees), oral presentation in the annual meeting in the Society of Civil Engineers.</p> <p>1 ~ 5 point: Attending the lecture held by Academic Society (Certification is required), number of points is determined by your supervisor in accordance to the level of difficulty for approval.</p> <p>3 point : Presentation in English in international conference. If the papers are peer-reviewed, the points are determined as journal papers (see below).</p> <p>5 ~ 10 point: First author or coauthor of published and/or accepted journal papers (e.g., for Journal of Society of Civil Engineers, ASCE Journal, etc.) (Number of points is determined by your supervisor depending on level of journal and/or your contribution.)</p> <p>Others: Exercise on project or training course (Number of points is determined by your supervisor). However,</p>					
Continue to 都市社会工学セミナーA(2)					

## 都市社会工学セミナーA(2)

the activities related to the other courses are not admitted, which are Exercise on Project Planning, Capstone Project, Internship on Infrastructure Engineering, Long-Term Internship, Practice in Infrastructure Engineering or Practice in Urban Management.

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG02 7F259 SJ58				
<b>Course title (and course title in English)</b>	都市社会工学セミナーB Seminar on Urban Management B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The students make the collection of datas, research and summarize the research results about the concrete and specific themes on Urban Management Engineering.. In addition, the teachers in this seminar instruct the students individually about the way of presentations of research results through the presentations and questions at the conferences at home and abroad, the ones at laboratory and participation in lecture classes.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,6times, ,8times, ,6times, ,8times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<p>Points are allocated for research activities such as a presentation at laboratory seminars, domestic conferences, international conferences, research paper presentation etc. Students are required to obtain the points in total which are more than predefined points.</p> <p>Students are required to get no less than 10 points in total for two years from M1 to M2, no less than 3 points in each year.</p> <p>1 point: Presentation at laboratory seminar (only if supervisor agrees), oral presentation in the annual meeting in the Society of Civil Engineers.</p> <p>1 ~ 5 point: Attending the lecture held by Academic Society (Certification is required), number of points is determined by your supervisor in accordance to the level of difficulty for approval.</p> <p>3 point : Presentation in English in international conference. If the papers are peer-reviewed, the points are determined as journal papers (see below).</p> <p>5 ~ 10 point: First author or coauthor of published and/or accepted journal papers (e.g., for Journal of Society of Civil Engineers, ASCE Journal, etc.) (Number of points is determined by your supervisor depending on level of journal and/or your contribution.)</p> <p>Others: Exercise on project or training course (Number of points is determined by your supervisor). However,</p>					
----- Continue to 都市社会工学セミナーB(2) -----					

## 都市社会工学セミナーB(2)

the activities related to the other courses are not admitted, which are Exercise on Project Planning, Capstone Project, Internship on Infrastructure Engineering, Long-Term Internship, Practice in Infrastructure Engineering or Practice in Urban Management.

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG32 7U201 SE58				
<b>Course title (and course title in English)</b>	都市社会工学総合セミナー A Integrated Seminar on Urban Management A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor, HARADA EIJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The students pick up the various types of influential elements on the development of urban society, and the students make the collection and analysis of datas in detail about these elements by themselves. In addition, on the basis of results of investigation and analysis, the students develop the argument about the ideal style or the future vision of urban society, and the students make the presentation and discussion in English about these results each other.					
<b>[Course objectives]</b>					
Goals are to cultivate students' ability for discussing research topic in English.					
<b>[Course schedule and contents]</b>					
Guidance, 1 time, Preparation for presentation, 2 times, Presentation on research and discussion, 10 times, Submission of presentation materials, 2 times.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluation for each student is made comprehensively based on presentation, discussion and participation in the classroom.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) None					
<b>[Study outside of class (preparation and review)]</b>					
Review the presentation contents in the seminar.					
<b>( Other information (office hours, etc.) )</b>					
Details will be provided in the guidance and first lecture.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG32 7U203 SE58				
<b>Course title (and course title in English)</b>	都市社会工学総合セミナー B Integrated Seminar on Urban Management B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
On the investigation of themes by the students, they make the presentation and discussion in English. The themes are about the urban policy on the world-wide viewpoint, the ideal style of urban management, the standardization of project technology for internationalization, the project management such as the contract, the tender, the management technology to country risk and so on, and about the problems on the structure of urban society for internationalization such as the technology movement or the role of Japan in the world on improving urban infrastructure.					
<b>[Course objectives]</b>					
Goals are to cultivate students' ability for discussing research topic in English.					
<b>[Course schedule and contents]</b>					
Guidance,1time, Preparation for presentation,2times, Presentation on research and discussion,10times, Submission of presentation materials,2times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluation for each student is made comprehensively based on presentation, discussion and attendance.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) None					
<b>[Study outside of class (preparation and review)]</b>					
Review the presentation contents in the seminar.					
<b>( Other information (office hours, etc.) )</b>					
Details will be provided in the guidance and first lecture.					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG02 7U210 PJ58					
<b>Course title (and course title in English)</b>	都市社会工学実習 Practice in Urban Management		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
To develop integrated and holistic understandings on Urban Management and cultivate problem-solving abilities, students are encouraged to attend a practical education and engineering program offered by educational institutes such as universities, international and domestic associations. Students attend a program under the instructions of academic supervisors. Programs are limited to the ones certified by the department.						
<b>[Course objectives]</b>						
To develop integrated and holistic understandings on Urban Management and cultivate problem-solving abilities by attending a practical education and engineering program offered by educational institutes such as universities, international and domestic associations.						
<b>[Course schedule and contents]</b>						
”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Attendance and reports are comprehensively evaluated.						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG32 7U216 PB58				
<b>Course title (and course title in English)</b>	都市社会工学ORT ORT on Urban Management		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
By practicing the research themes on Urban Management and making the presentations of research results at the conferences, the students can develop the advanced specialities, the ability of finding out the new fields of research. Also, the students can get the practical ability which is necessary for researchers and engineers. The students can participate in the conferences at home and abroad, the presentations of research at laboratory, some kinds of seminars and symposiums, lecture classes and internship to the enterprises or research organizations at home and abroad. The director of the department and the supervisor totally evaluate the reports made about these activities by the students.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,6times, ,8times, ,6times, ,8times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
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Continue to 都市社会工学ORT(2)					

## 都市社会工学ORT(2)

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

Details will be given in the guidance.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG32 7U224 PB58				
<b>Course title (and course title in English)</b>	都市社会工学総合実習A Practice in Advanced Urban Management A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,5times, ,2times, ,5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG32 7U225 PB58					
<b>Course title (and course title in English)</b>	都市社会工学総合実習B Practice in Advanced Urban Management B			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KASHIWAYA KOUKI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,3times, ,5times, ,2times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG03 5A622 LJ15				
<b>Course title (and course title in English)</b>	地圏環境工学特論 Geohydro Environment Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YONEDA MINORU Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
With the theme of conservation of the geosphere environment and contamination countermeasures, lectures are given on the current situation of surrounding groundwater both in Japan and abroad, sustainable groundwater use from the viewpoint of groundwater quality, various global environmental problems related to the geosphere environment, countermeasures, and so forth. In particular, geostatistics, which is a field of spatial statistics, used as a method of investigating the contamination of soil among other things, will be described in detail from its theoretical foundation to application. Additionally, the programming for analyzing spatial data in geostatistics, and the programming method by Excel VBA through a numerical simulation program related to groundwater pollution using Excel VBA will be explained.					
<b>[Course objectives]</b>					
Recognizing the importance of groundwater in Japan and abroad, understanding the basics of geostatistics for estimating the spatial distribution of soil and groundwater contamination, and the foundation of numerical simulation on groundwater pollution.					
<b>[Course schedule and contents]</b>					
Current state of domestic and overseas groundwater (1 time) The usage situation of groundwater in Japan and abroad and its importance will be outlined.					
Sustainable groundwater usage method (1 time) Through examples of degradation of groundwater quality in the Kyoto basin, the method of sustainable groundwater use will be outlined from a qualitative point of view.					
Geosphere environment and global environmental issues (1 time) In particular, the global environmental problems in the geosphere environment will be outlined.					
Introduction to VBA (1 time) In particular, the programming method of Excel VBA that is necessary for numerical calculation in a way that is easy to understand by FORTRAN users will be outlined.					
Introduction to geostatistics 1 (1 time) The analysis procedure of spatial data by geostatistics and the method of data review as the first procedure will be outlined.					
Introduction to geostatistics 2 (1 time) The importance of the variogram as a statistical structure of the field and how to obtain it will be outlined.					
----- Continue to 地圏環境工学特論(2) -----					

## 地圏環境工学特論(2)

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### Introduction to geostatistics 3 (1 time)

The spatial distribution and the method of kriging to estimate its uncertainty will be outlined.

### Introduction to geostatistics 4 (1 time)

The statistical processing method when there is a lot of data below the detection limit and overranged data will be outlined.

### Introduction to geostatistics 5 (1 time)

Cokriging and its simplified method for estimating the spatial distribution using several types of data will be outlined.

### Introduction to geostatistics 6 (1 time)

A conditional simulation method as a simulation method considering spatial uncertainty and its usage will be outlined.

### Chemistry and simulation of soil and groundwater (1 time)

The fundamentals of chemistry to understand the relation between soil pollution and groundwater contamination, as well as the method to simulate the change of groundwater quality will be outlined.

### Introduction to groundwater simulation (4 times)

The basics of numerical simulations on groundwater contamination will be outlined.

## [Course requirements]

Basics of linear algebra and probability statistics

## [Evaluation methods and policy]

Evaluated by the average scores of about 10 reports. The themes of the reports will be given at some lectures. The result of the average score should be 60 and above out of 100.

60 and above: Passed

59 and below: Failed

The score of the reports which are not submitted are evaluated as 0.

## [Textbooks]

Not used

Handout will be given at each lecture.

## [References, etc.]

### ( Reference books )

Others; to be recommended during class as necessary.

### ( Related URLs )

<http://risk.env.kyoto-u.ac.jp/chiken/index.html>

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Continue to 地圏環境工学特論(3)

## 地圏環境工学特論(3)

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### [Study outside of class (preparation and review)]

Completely understand the contents of each handout.

### ( Other information (office hours, etc.) )

In consideration of social conditions and so forth, there are cases where class items and contents may be changed.

Please check KULASIS for the information of office hour!

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG03 5A626 LJ24				
<b>Course title (and course title in English)</b>	環境衛生学特論 Environmental Health, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Global Environmental Studies Professor, TAKANO HIROHISA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Environmental factors and genetic factors are responsible for our health and diseases. This seminar has the lecture on the relationships between environmental factors and our health. Also, Students make presentation and discussion on the previous and recent environmental problems, with special emphasis on their relation with health concerns.					
<b>[Course objectives]</b>					
Students learn about the fundamentals of environmental health and make use of the knowledge for the development of related areas.					
<b>[Course schedule and contents]</b>					
Environment and health, 2 times, Lecture on the relationships between environmental factors and our health Seminar on the previous and recent environmental problems, 13 times, Presentation and discussion on the previous and recent environmental problems, with special emphasis on their relation with health concerns					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Points are allocated for the activities on the presentation and discussion.					
<b>[Textbooks]</b>					
Not used. To be introduced from time to time in the lecture.					
<b>[References, etc.]</b>					
( <b>Reference books</b> )					
To be introduced during class. To be introduced from time to time in the lecture.					
<b>[Study outside of class (preparation and review)]</b>					
If knowledge of high school biology is insufficient, it might be considered desirable to review every time. No particular preparations are necessary.					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG03 5A632 LB24				
<b>Course title (and course title in English)</b>	都市代謝工学 Urban Metabolism Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKAOKA MASAKI Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI Graduate School of Engineering Assistant Professor, KUSAKABE TAKETOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Much energy and resources are consumed to maintain various activities in urban city. As the result, various environmental loads such as exhaust gas, wastewater and waste generate and should be reduced to levels natural environment can accept. To establish sustainable urban metabolism, concept, elements, control, optimization and management of urban metabolism are explained.					
<b>[Course objectives]</b>					
To understand technological measures by learning about current trend and issue of urban metabolism and related engineering principles.					
<b>[Course schedule and contents]</b>					
<p>Class 1: Introduction (Takaoka) Concept of urban metabolism and its system are explained.</p> <p>Class 2-10: Elements of urban metabolic system (Takaoka: 7, Oshita: 3) Planning and selection of urban metabolic system, Transportation &amp; collection, Engineering principles on Recycling, Thermal recovery, Engineering principles on flue gas treatment and Landfill management are explained.</p> <p>Class 11-12: Hazardous Waste Management (Takaoka, Kusakabe :2) Treatment, disposal and management of hazardous waste are explained.</p> <p>Class 13-14: Design of sewage treatment system in urban area (Oshita: 2) Properties and chemical compositions of sewage and sludge. Introduction and developing trend of sewage treatment system. Elemental and heat balance analysis of sedimentation, aeration tank, anaerobic fermentation and incineration.</p> <p>Class 15: Feedback (Takaoka, Oshita, Kusakabe) We will answer/discuss about questions for the results of small tests and reports or the contents of lectures via E-mail etc.</p>					
<b>[Course requirements]</b>					
It is desirable that students have already learned Environmental plant engineering.					
Continue to 都市代謝工学(2)					

## 都市代謝工学(2)

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### [Evaluation methods and policy]

Small tests and reports(70%)  
Participation (30%)

### [Textbooks]

Learning materials are delivered in class.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Review the learning materials used in class.

### ( Other information (office hours, etc.) )

The order of lecture content can be changed. Questions about each class should be given to each faculty member. Questions about overall class should be given to Professor Takaoka.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 5A643 LJ16				
<b>Course title (and course title in English)</b>	環境微生物学特論 Environmental Microbiology, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, Fujiwara Taku Graduate School of Engineering Associate Professor, NISHIMURA FUMITAKE Graduate School of Engineering Senior Lecturer, HIDAHA TAIRA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>The roles of microorganisms in the environment and the utilization methods of them for environmental purification are explained with state-of-the-art research findings. Besides, literature review and presentation of the reviewing results are certainly required in order to understand latest research findings and application to environmental engineering. The concrete contents are as follows; 1) Fundamental science: classification, cultivation, function, gene and genetic analysis of microorganisms, growth rate and biological reaction kinetics. 2) Application of environmental engineering: analyses with mathematical model and simulation, bio assay and bio sensor, relationship between waterborne disease and microorganisms, relationship between phytoplankton growth and hazardous substances production. Presentation and discussion about literature review by the students are prepared.</p>					
<b>[Course objectives]</b>					
<p>To understand fundamental knowledge of microbiology, which can support environmental engineering.</p> <p>To discuss current situation and challenges about application of microorganisms for solution of environmental problem, and study with practice.</p>					
<b>[Course schedule and contents]</b>					
<p>(1) Basic of Environmental Microbiology: [1 time] Introduction of this course: Objectives, composition, and basic of the environmental microbiology. How to review the latest research results from literature, and presentation.</p> <p>(2) Classification, Nomenclature, Cultivation, and Function of Microorganisms: [1 time]</p> <p>(3) Microbial ecosystem structure and Microorganism community analysis by gene information: [2 times]</p> <p>(4) Metabolism of microorganisms, and material transformation: [2 times]</p> <p>(5) Mathematical model of microbial activity and numerical analysis by computer: [1 time]</p> <p>(6) Environmental measurement and evaluation using microorganisms: [1 time]</p> <p>(7) Waterborne diseases and microorganisms: [1 time]</p> <p>(8) Phytoplankton growth and hazardous substances production: [1 time]</p> <p>(9) Presentation and Discussion of each research subject: [3 times]</p>					
Continue to 環境微生物学特論(2)					

## 環境微生物学特論(2)

(10) Keynote address by an up-and-coming specialist of microbiology: [1 time]

- Final examination/ Learning achievement evaluation(1 time):
- Feedback(1 time):

### [Course requirements]

None

### [Evaluation methods and policy]

Evaluation will be based on both one written examination and report & presentation of each research topic.

### [Textbooks]

Materials for each lecture will be provided.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Review with related literature is strongly recommended in order to understand broadly based knowledge and to obtain useful information.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 5F234 LB15				
<b>Course title (and course title in English)</b>	水質衛生工学 Water Sanitary Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, ITOH SADAHIKO Graduate School of Global Environmental Studies Professor, ECHIGO SHINYA Graduate School of Engineering Assistant Professor, NAKANISHI TOMOHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The ultimate goal of this course is to understand Sanitary Engineering quantitatively. Students will learn methods to quantify chemical and microbial risk in drinking water and realize concept and methods of risk management and control.					
<b>[Course objectives]</b>					
To quantify chemical and microbial risk in drinking water and to realize methodologies of risk management and control.					
<b>[Course schedule and contents]</b>					
<p>Environmental risk and quantification (1 time; Itoh) Introduction and goal of the class. Concept of Sanitation. Environmental risk and quantification. Safety of drinking water and acceptable risk level.</p> <p>Quantitative microbial risk assessment and management (5 times; Itoh) Coexistence and competition between human and microbes. Quantitative microbial risk assessment (QMRA). Comparison of the risk assessment and management methods between chemicals and microbes. Disability adjusted life years (DALYs).</p> <p>Risk assessment and control of hazardous chemicals (3 times; Itoh) Risk assessment of hazardous chemicals. Drinking water quality standards. Derivation of drinking water quality standards. The benchmark dose method.</p> <p>Global burden of disease and its index (2 times; Nakanishi) Disability-adjusted life years and its significance.</p> <p>Perspectives of water treatment technology (3 times; Echigo) Development of advanced water treatment processes. Water supply technology and its prospects. Water reuse and health risk. Access to safe drinking water in developing countries and global burden of disease.</p> <p>Feedback and summary (1 time; All the professors) Feedback of assignments and summary.</p>					
Continue to 水質衛生工学(2)					

## 水質衛生工学(2)

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### [Course requirements]

General understanding of water quality and water treatment process

### [Evaluation methods and policy]

Evaluated by assignments.

### [Textbooks]

Class handouts

### [References, etc.]

#### ( Reference books )

Itoh, S., Echigo, S.: Disinfection By-products in Water, GIHOUDOU SHUPPAN Co., Ltd., 2008 (in Japanese).

#### ( Related URLs )

(Data for assignments will be at <http://www.urban.env.kyoto-u.ac.jp>)

### [Study outside of class (preparation and review)]

Instruction will be given by the professors.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 7F400 PJ16				
<b>Course title (and course title in English)</b>	都市環境工学セミナー A Seminar on Urban and Environmental Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Provide seminar assignments related to a wide range of problems in each educational field of environmental engineering such as advanced research related to urban environmental engineering, actual problems requiring solutions, examples of advanced activities in real society, and the specialization of each student deepen discovery and understanding of problems from a field perspective. Acquire individual guidance from the supervisor on the method of research investigation on issues, the method of collecting related information and the method of writing paper. Students need to give reports and presentations, and discuss with supervisors. Finally students must summarize their master's research in original research paper.					
<b>[Course objectives]</b>					
To understand the overall picture of the issues related to urban environmental engineering and to summarize the master's research in original research paper.					
<b>[Course schedule and contents]</b>					
<p>Issue 1 setting (1 time) Set issue 1 on urban environmental engineering that each student studies.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected task 1.</p> <p>1st presentation (1 time) Each student presents the contents of survey and research on task 1 to the teachers in charge and receives questions and evaluations.</p> <p>Task 2 setting (1 time) Set issue 2 on urban environmental engineering that each student studies.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected task 2.</p> <p>2nd presentation (1 time) Each student presents the contents of research and research on problem 2 to the teachers in charge and receives questions and evaluations.</p> <p>Issue 3 setting (1 time) Set issue 3 on urban environmental engineering to be studied by each student.</p>					
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Continue to 都市環境工学セミナー A(2)					



## 都市環境工学セミナー A(2)

Survey and progress report (1 time)

Each student conducts survey and research on selected task 3.

The 3rd presentation (1 time)

Each student presents the contents of research and research on problem 3 to the teachers in charge, and receives questions and evaluations.

Task 4 Setting (1 time)

Set issue 4 on urban environmental engineering that each student studies.

Survey and progress report (1 time)

Each student conducts survey and research on selected task 4.

The 4th presentation (1 time)

Each student presents the contents of survey and research on task 4 to the teachers in charge and receives questions and evaluations.

Writing paper (3 times)

According to supervisor's guidance, each student summarizes the master's thesis in original research paper.

### [Course requirements]

None

### [Evaluation methods and policy]

Students must submit original paper-style documents by the specified date (end of September), and the supervisor comprehensively evaluates the activities at the seminar along with the evaluation of the documents.

If the student has already published an original paper, he/she can submit it. This original paper must be peer-reviewed, but it may be a peer-reviewed paper in conference proceedings. However, peer-reviewed abstracts can not be accepted.

Students should submit this document as PDF file via Panda. The file name should include student's name (in the order of first and last name, connect the first and last names with an underscore). For example, "Kankyo\_Taro.pdf".

### [Textbooks]

Handout will be given accordingly.

### [References, etc.]

( Reference books )

Handout will be given accordingly.

Continue to 都市環境工学セミナー A(3)

都市環境工学セミナー A (3)

**[Study outside of class (preparation and review)]**

Good preparation and enough review are required.

**( Other information (office hours, etc.) )**

Please check KULASIS for the information of my office hour.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 7F402 PJ16				
<b>Course title (and course title in English)</b>	都市環境工学セミナー B Seminar on Urban and Environmental Engineering B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Provide seminar assignments related to a wide range of problems in each educational field of environmental engineering such as advanced research related to urban environmental engineering, actual problems requiring solutions, examples of advanced activities in real society, and the specialization of each student deepen discovery and understanding of problems from a field perspective. Acquire individual guidance from the supervisor on the method of research investigation on issues, the method of collecting related information and the method of writing paper. Students need to give reports and presentations, and discuss with supervisors. Finally students must summarize their master's research in original research paper.					
<b>[Course objectives]</b>					
To understand the overall picture of the issues related to urban environmental engineering and to summarize the master's research in original research paper.					
<b>[Course schedule and contents]</b>					
<p>Issue 1 setting (1 time) Set issue 1 on urban environmental engineering that each student studies.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected task 1.</p> <p>1st presentation (1 time) Each student presents the contents of survey and research on task 1 to the teachers in charge and receives questions and evaluations.</p> <p>Task 2 setting (1 time) Set issue 2 on urban environmental engineering that each student studies.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected task 2.</p> <p>2nd presentation (1 time) Each student presents the contents of research and research on problem 2 to the teachers in charge and receives questions and evaluations.</p> <p>Issue 3 setting (1 time) Set issue 3 on urban environmental engineering to be studied by each student.</p>					
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Continue to 都市環境工学セミナー B (2)					

## 都市環境工学セミナー B (2)

Survey and progress report (1 time)

Each student conducts survey and research on selected task 3.

The 3rd presentation (1 time)

Each student presents the contents of research and research on problem 3 to the teachers in charge, and receives questions and evaluations.

Task 4 Setting (1 time)

Set issue 4 on urban environmental engineering that each student studies.

Survey and progress report (1 time)

Each student conducts survey and research on selected task 4.

The 4th presentation (1 time)

Each student presents the contents of survey and research on task 4 to the teachers in charge and receives questions and evaluations.

Writing paper (3 times)

According to supervisor's guidance, each student summarizes the master's thesis in original research paper.

### [Course requirements]

None

### [Evaluation methods and policy]

Students must submit original paper-style documents by the specified date (end of September), and the supervisor comprehensively evaluates the activities at the seminar along with the evaluation of the documents.

If the student has already published an original paper, he/she can submit it. This original paper must be peer-reviewed, but it may be a peer-reviewed paper in conference proceedings. However, peer-reviewed abstracts can not be accepted.

Students should submit this document as PDF file via Panda. The file name should include student's name (in the order of first and last name, connect the first and last names with an underscore). For example, "Kankyo\_Taro.pdf".

### [Textbooks]

Handout will be given accordingly.

### [References, etc.]

( Reference books )

Handout will be given accordingly.

Continue to 都市環境工学セミナー B (3)

都市環境工学セミナー B (3)

**[Study outside of class (preparation and review)]**

Good preparation and enough review are required.

**( Other information (office hours, etc.) )**

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG03 5F439 LE24			
<b>Course title (and course title in English)</b>	環境リスク学 Environmental Risk		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,YONEDA MINORU Graduate School of Engineering Associate Professor,MATSUDA TOMONARI Graduate School of Global Environmental Studies Professor,TAKANO HIROHISA Graduate School of Engineering Associate Professor,YOKO SHIMADA Agency for Health, Safety and Environment Professor,MATSUI YASUTO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Paying attention to the environment of children in particular, students themselves study, make presentation, and debate about the environmental risk. Students learn the background, the actual situation, and the theory for quantitative risk analysis through practice of investigation and discussion by themselves.					
<b>[Course objectives]</b>					
To understand or master the necessity of environmental risk analysis, its practical exampls, framework for solving problems concerning to risk evaluation, technical and basic knowledge for environmental risk analysis, and the way of thinking for risk analysis					
<b>[Course schedule and contents]</b>					
Introduction Framework of risk analysis,2times,Introduction of lecture and grading. Framework of risk analysis for children of WHO.					
Children and health risk,1time,1) Why children 2) Children are not little adults					
Children and environmental change,1time,3) The paediatric environmental and health history 4) Global change and children					
Air pollution,1time,5) Outdoor air pollution 6) Indoor air pollution					
Lead and pesticide,1time,7) Pesticides 8) Lead					
Heavy metal,1time,9) Mercury 10) Other heavy metals					
Various risk,1time,11) Noise 12) Water 13) Food safety					
Chemicals,1time,14) Children and chemicals 15) Persistent Organic Pollutants					
Tobacco and natural toxin,1time,16) Second-hand tobacco smoke 17) Mycotoxins, plants, fungi and derivates					
Occupational risk and radiation,1time,18) Injuries 19) Ionizing and non-ionizing radiations 20) Occupational risks					
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Continue to 環境リスク学(2)					

## 環境リスク学(2)

Respiratory diseases and cancer,1time,21) Respiratory diseases 22) Childhood cancer

Innune disorders and neural system,1time,23) Immune disorders 24) Neurobehavioral and neurodevelopmental disorders

Endocrine system and environmental monitoring,1time,25) Endocrine disorders 26) Bio-monitoring and environmental monitoring

D developmental toxicity and indicators,1time,27) Early developmental and environmental origins of disease 28) Indicators

### [Course requirements]

Not necessary in particular.

### [Evaluation methods and policy]

Evaluation will be based on presentation (30%), assigned discussion (30%) and class performance (40%). Class performance will be highly evaluated with active participation to discussions.

### [Textbooks]

Handouts will be supplied.

### [References, etc.]

( Reference books )

To be introduced, if necessary.

### [Study outside of class (preparation and review)]

Sincerely and fully prepare for the presentation and discussion.

### ( Other information (office hours, etc.) )

The contents may be changed according to the progress of lecture.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG03 5F441 LJ16			
<b>Course title (and course title in English)</b>	水環境工学 Water Quality Control Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,Fujiwara Taku Graduate School of Engineering Associate Professor,NISHIMURA FUMITAKE Graduate School of Engineering Senior Lecturer,HIDAKA TAIRA Graduate School of Engineering Assistant Professor,TAKEUCHI HARUKA Graduate School of Engineering Assistant Professor,NOMURA YOUHEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Water resource management from the points of both water quantity and water quality is described, for example, mechanism of water pollution and history, and current conditions of water quality standard, Water quality indexes and their analytical technologies including biological methods and instrumental analytical technique are explained as well. Water and wastewater treatment technologies of physical, chemical and biological process including energy and resource recovery are expound.					
<b>[Course objectives]</b>					
To understand management methods of water environment and evaluation of water environment condition.					
To acquire technologies of water and wastewater treatment enough to apply them from the point of creation of recycling-oriented society.					
<b>[Course schedule and contents]</b>					
<ul style="list-style-type: none"> <li>• Water pollution its history and Water quality standard(1 time): Introduction of this class. Basic and major water pollution and their generation mechanism are explained, and the history of water pollution and solution are introduced.</li> <li>• Water quality indexes and analysis(2 times) Basic knowledge for Water quality indexes and their analysis including instrumental analysis are explained.</li> <li>• Water pollution and evaluation(5 times) Water pollution characteristics in rivers, lakes and sea, and countermeasures are explained. Behaviors of recalcitrant organic compounds and emerging contaminants such as PPCPs(Pharmaceuticals and Personal Care Products) and EDCs(Endocrine-Disrupting Chemicals) are explained, and their impacts on water environment are expounded. Based on the understanding, watershed management is explained.</li> <li>• Water and wastewater treatment(5 times) Basic countermeasure against water pollution is to remove the pollutants from the wastewater. Fundamental technologies are introduced categorizing into physical, chemical, and biological processes, and each process is explained in detail. Disinfection and water reuse are also introduced from the points of chemicals management.</li> </ul>					
Continue to 水環境工学(2)					



## 水環境工学(2)

- Resource recovery and system(1 time):

Resource recovery is important from the points of both creation of recycling-oriented society and prevention of global warming. Technologies and systems accomplishing energy and resource recovery from wastewater is introduced and explained

- Final examination/ Learning achievement evaluation(1 time):

- Feedback(1 time):

### [Course requirements]

None

### [Evaluation methods and policy]

Evaluation will be based on one written examination.

### [Textbooks]

Materials for each lecture will be provided.

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Review with related literature is strongly recommended in order to understand broadly based knowledge and to obtain useful information.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 5F446 LB15				
<b>Course title (and course title in English)</b>	大気・地球環境工学特論 Atmospheric and Global Environmental Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,FUJIMORI SHINICHIRO Graduate School of Engineering Assistant Professor,OSHIRO KEN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
The contents of the lecture are as follows. (1) History of Global Warming problem, Radiative forcing, Green house gas emission, Carbon cycle, Mechanism of Climate Change, Mitigation measures, Social and Natural impact of Climate change (2) Mechanism of formation of Photochemical oxidant and Acid rain, Global scale transportation of atmospheric pollutants, Deposition and its impact of air pollutants, control measure of air pollution. Also, students make presentation and discussion on the related papers.					
<b>[Course objectives]</b>					
By the end of the course, students will be able to understand the mechanisms of climate change and air pollution, and learn to solve the problems by themselves.					
<b>[Course schedule and contents]</b>					
Guidance, IPCC, Observation of a climate change ,1time, Carbon cycle and response of climate,1time, Impact of Climate Change,1time, Climate change mitigation (1),1time, Climate change mitigation(2),1time, Climate change mitigation and possible side effects,1time, Urban air pollution, transboundary transport of air pollution, and international measures,1time, Literature review presentation,1time, Literature review presentation(1),1time, Literature review presentation(2),1time, Literature review presentation(3),1time, Literature review presentation(4),1time, Literature review presentation(5),1time, Literature review presentation(6),1time, Achievement test,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Points are allocated for the quiz at every lectures, the presentation and discussion, report.					
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Continue to 大気・地球環境工学特論(2)					

## 大気・地球環境工学特論(2)

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### [Textbooks]

Handout

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

The students are required to prepare for the presentation with sufficient time.

### ( Other information (office hours, etc.) )

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 7F449 SJ16				
<b>Course title (and course title in English)</b>	都市環境工学演習 A Laboratory and Seminar on Urban and Environmental Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Participate in internships at international organizations, or national and local governments, public organizations, companies and overseas, overseas training that are carrying out environmental engineering researches, investigations or projects. Submit reports and give presentations. In addition to the planning and programs that teachers arrange, students can go internships applying to the programs of various organizations.					
<b>[Course objectives]</b>					
To conduct the internship and obtain					
<b>[Course schedule and contents]</b>					
<p>Internship content determination (2 times) Select internships where each student participates.</p> <p>Research / Research (10 times) Through internships, you gain professional knowledge and experience.</p> <p>Report creation (2 times) Report on experience gained by internship and submit.</p> <p>Presentation (1 time) In response to the teachers in charge, we will announce the content of the report and ask questions and respond.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
The results will be evaluated comprehensively.					
<div style="text-align: right;">Continue to 都市環境工学演習 A (2)</div>					

## 都市環境工学演習 A (2)

### [Textbooks]

Not used

Handout will be given accordingly.

### [References, etc.]

( **Reference books** )

Handout will be given accordingly.

### [Study outside of class (preparation and review)]

Follow the instructions of your supervisor.

### ( **Other information (office hours, etc.)** )

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG03 7F450 SJ16			
<b>Course title (and course title in English)</b>	都市環境工学演習 B Laboratory and Seminar on Urban and Environmental Engineering B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Participate in internships at international organizations, or national and local governments, public organizations, companies and overseas, overseas training that are carrying out environmental engineering researches, investigations or projects. Submit reports and give presentations. In addition to the planning and programs that teachers arrange, students can go internships applying to the programs of various organizations.					
<b>[Course objectives]</b>					
To					
<b>[Course schedule and contents]</b>					
Task assignment (1 time) Set up the tasks that each student intends to investigate.					
Research / Research (1 time) Study and study on the tasks that have been set up and prepare presentation materials.					
Presentation and question and answer (1 time) In small classes, research presentation and question and answer are done.					
Task assignment (1 time) Set up the tasks that each student intends to investigate.					
Research / Research (1 time) Study and study on the tasks that have been set up and prepare presentation materials.					
Presentation and question and answer (1 time) In small classes, research presentation and question and answer are done.					
Task assignment (1 time) Set up the tasks that each student intends to investigate.					
Research / Research (1 time) Study and study on the tasks that have been set up and prepare presentation materials.					
Presentation and question and answer (1 time) In small classes, research presentation and question and answer are done.					
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Continue to 都市環境工学演習 B (2)					

## 都市環境工学演習 B (2)

Task assignment (1 time)

Set up the tasks that each student intends to investigate.

Research / Research (1 time)

Study and study on the tasks that have been set up and prepare presentation materials.

Presentation and question and answer (1 time)

In small classes, research presentation and question and answer are done.

Task assignment (1 time)

Set up the tasks that each student intends to investigate.

Research / Research (1 time)

Study and study on the tasks that have been set up and prepare presentation materials.

Presentation and question and answer (1 time)

In small classes, research presentation and question and answer are done.

### [Course requirements]

None

### [Evaluation methods and policy]

The results will be evaluated comprehensively.

### [Textbooks]

Handout will be given accordingly.

### [References, etc.]

( Reference books )

Handout will be given accordingly.

### [Study outside of class (preparation and review)]

Follow the instructions of your supervisor.

### ( Other information (office hours, etc.) )

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG03 5F454 LB24			
<b>Course title (and course title in English)</b>	循環型社会システム論 Systems Approach on Sound Material Cycles Society		<b>Instructor's name, job title, and department of affiliation</b>	Agency for Health, Safety and Environment Professor, HIRAI YASUHIRO Agency for Health, Safety and Environment Assistant Professor, YANO JUNYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>It has been a major political/ social issue to establish a Sound Material-Cycle Society to save the resources and protect the environment. This course mainly covers the following topics:</p> <p>1) History, current status, and the prospect of waste issues and establishing a sound material-cycles society.</p> <p>2) Basic concepts and current conditions/ challenges of the following items: The Basic Law for Establishing the Material Cycles Society and the Basic Plan for accomplishing it; Containers and Packaging Recycling Law; Home Appliance Recycling Law; End-of-Life Vehicle Recycling Law and others.</p> <p>3) Basic concept and application of material flow analysis (MFA) and life cycle assessment (LCA). MFA and LCA are important to grasp the whole flow of resource use, product consumption, recycling, and disposal of waste.</p> <p>Along with the above topics, source origin, behavior, and decomposition of persistent organic pollutants, which should be inevitably linked to the realization of a Sound Material-Cycle Society, will also be discussed in the class.</p>					
<b>[Course objectives]</b>					
<p>The goals of this class are as follows;</p> <p>To understand the systems and technologies for the formation of a sound material-cycles society.</p> <p>To understand the basics and current status of recycling systems and issues related to food loss and waste, packaging and containers, plastic resource recycling, end-of-life vehicles, and waste electrical and electronic equipment.</p> <p>To understand the concept of material flow analysis.</p> <p>To be able to conduct a life cycle assessment.</p> <p>To understand the basic concept of multi-media environmental fate model (Fugacity model) of chemical substances.</p> <p>To understand the source, fate, and management of persistent organic pollutants (POPs).</p>					
<b>[Course schedule and contents]</b>					
<ol style="list-style-type: none"> <li>1. The Fundamental Law and Plan for Establishing a Sound Material-Cycles Society (Hirai)</li> <li>2. Food Loss and Food Waste (Yano)</li> <li>3. Packaging and Containers Waste (Yano)</li> <li>4. Resource Circulation Strategy for Plastics (Yano)</li> <li>5. End of Life Vehicles (Yano)</li> <li>6. E-Waste (Hirai)</li> <li>7. Material Flow Analysis and Life Cycle Thinking (Yano)</li> <li>8. Data Reconciliation Method for MFA (Hirai)</li> <li>9. Life-Cycle Assessment: Goal and Scope Definition (Hirai)</li> <li>10. Life-Cycle Assessment: Inventory Analysis (Hirai)</li> </ol>					
----- Continue to 循環型社会システム論(2) -----					



## 循環型社会システム論(2)

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11. Life-Cycle Assessment: Impact Assessment (Hirai)
  12. Life-Cycle Assessment: Interpretation, Case Studies (Hirai)
  13. Environmental Fate Model for Chemicals: Basics (Hirai)
  14. Environmental Fate Model for Chemicals: Application (Hirai)
- <<Final examination>>
15. Feedback (Hirai)

### [Course requirements]

Solid Waste Management

### [Evaluation methods and policy]

The evaluation will be based on an examination (60 points), quizzes (20 points), and assignments (20 points).

### [Textbooks]

Not used

Not specified. Materials and references will be distributed when needed.

### [References, etc.]

#### ( Reference books )

Introduced during class

Additional resources will be introduced during the class.

### [Study outside of class (preparation and review)]

After class, answer the quiz questions posted on Panda to confirm that you have understood the lecture content. Review the materials and references distributed. Specific instructions, if any, will be given in class.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG03 5F456 LE16			
<b>Course title (and course title in English)</b>	新環境工学特論I New Environmental Engineering I, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SHIMIZU YOSHIHISA Graduate School of Global Environmental Studies Professor, ECHIGO SHINYA Graduate School of Engineering Associate Professor, NISHIMURA FUMITAKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course provides various kinds of engineering issues related to the water environment in English, which cover fundamental knowledge, the latest technologies and regional application examples. These lectures, English presentations by students, and discussions enhance English capability and internationality of students. The course is conducted in simultaneous distance-learning from Kyoto University, or from remote lecture stations in University of Malaya, and Tsinghua University of China. For the distance-learning, a hybrid system is used, which consists of prerecorded lecture VIDEO, VCS (Video conference system) and SS (slide sharing system).					
<b>[Course objectives]</b>					
Each student is requested to give a short presentation in English in the end of the course. The students will understand the present circumstance of environments in the world, and the students may improve their English skill and international senses through these lectures, presentations, and discussions.					
<b>[Course schedule and contents]</b>					
Guidance & Self Introduction of Students + Lecture: From Ecotoilets to Ecotowns ( Shimizu)					
Anaerobic Technologies for Wastewater Treatment(Prof. Shaliza, University of Malaya)					
Wastewater Treatment Plant: Case Study in China, Biological Nutrient Removal (BNR) (Prof. Wen, Tsinghua University)					
Development of Wastewater Treatment Technologies: History and Recent Trends in Japan (Nishimura)					
Water Supply in Malaysia: Challennges and Oppurtunities(Prof. Faridah, University of Malaya)					
Treatment Technologies (Practical & Advanced Technology I): Membrane Technology (MT) (Prof. Huang, Tsinghua University)					
Advanced Oxidation Processes (Prof. Zhang, Tsinghua University)					
Current Issues in Drinking Water Treatment in Japan (Echigo)					
Student Presentations /Discussions I (all)					
Student Presentations /Discussions II (all)					
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Continue to 新環境工学特論I(2)					

## 新環境工学特論I(2)

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Student Presentations /Discussions III (all)

### **[Course requirements]**

General understanding of water environmental issues

### **[Evaluation methods and policy]**

Evaluated by class attendance, Q&A and presentation.

### **[Textbooks]**

Class handouts

### **[References, etc.]**

#### **( Reference books )**

Introduced in the classes

### **[Study outside of class (preparation and review)]**

The students should study the PPT file used in the lectures. Students also need to enough literature review and related prior to their presentation.

### **( Other information (office hours, etc.) )**

PowerPoint slides are main teaching materials in the lectures, and their hard copies are distributed to the students. In addition, a list of technical terms and difficult English words is given to the students with their explanation and Japanese translation.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 5F458 LE16				
<b>Course title (and course title in English)</b>	新環境工学特論II New Environmental Engineering II, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TAKAOKA MASAKI Graduate School of Global Environmental Studies Professor,TAKANO HIROHISA Graduate School of Engineering Associate Professor,FUJIMORI SHINICHIRO Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>The course is conducted in simultaneous distance-learning from Kyoto University, or from remote lecture stations in University of Malaya, and Tsinghua University. For the distance-learning, a Zoom system is used. The students are requested to give a short presentation in English in the end of the lecture course. This course may improve students ' English skill and international senses through these lectures, presentations, and discussions.</p> <p>The course provides various kinds of engineering issues related to atmospheric environment, climate change and solid wastes management in English, which cover fundamental knowledge, the latest technologies and regional application examples. These lectures, English presentations by students, and discussions enhance English capability and internationality of students.</p>					
<b>[Course objectives]</b>					
This lecture expects students to freely discuss environmental issues on air and solid wastes with international researchers and students in English. For this purpose, the course encourages the students to conduct self-study for following up each lecture's contents, and requests them to enhance their capabilities by preparations on issues related to water environment.					
<b>[Course schedule and contents]</b>					
<p>No.1 Global warming and Low carbon society ( Assoc. Prof. Fuimori, Kyoto University )</p> <p>No.2 Atmospheric diffusion and modeling (Prof. S Wang, Tsinghua University)</p> <p>No.3 Air Pollution, Its Historical Perspective from Asian Countries (II), Malaysia (Assoc. Prof. Nasrin Aghamohammadi, University of Malaya)</p> <p>No.4 Air Pollution, Its Historical Perspective from Asian Countries (III), Japan (Prof. Takano, Kyoto University)</p> <p>No.5 Student Presentations /Discussions I (all)</p> <p>No.6</p>					
Continue to 新環境工学特論II(2)					

## 新環境工学特論II(2)

Introduction to Municipal Solid Waste (MSW) Management in Malaysia (Assoc. Prof. Fauziah Shahuk Hamid, University of Malaya)

No.7  
Solid Waste Management, Case Study in China (Assoc. Prof. Lu Wenjing, Tsinghua University)

No.8  
Solid Waste Management, Case Study in Japan (Prof. Takaoka, Kyoto University )

No.9  
Solid Waste Management, Case Study in Malaysia (Assoc. Prof. Noor Zalina Mahamood, University of Malaya)

No.10  
Student Presentations /Discussions II (all)

No.11  
Student Presentations /Discussions III (all)

No.12:Feedback  
We will answer/discuss about questions for the results of small tests and reports or the contents of lectures via E-mail etc.

### [Course requirements]

None

### [Evaluation methods and policy]

Evaluate by class attendance(40%), and presentation and Q&A (60%).

### [Textbooks]

Not used

### [References, etc.]

( Reference books )  
Introduced during class  
To be announced at the class.

### [Study outside of class (preparation and review)]

Preparation homework is not required, but homework is recommended to follow up each lecture's contents.

### ( Other information (office hours, etc.) )

A lecture (16:30 - 18:30) is 120 min.  
A student presentation is 130 min.

Continue to 新環境工学特論II(3)

## 新環境工学特論II(3)

PowerPoint slides are main teaching materials in the lectures, and their hard copies are distributed to the students. In addition, a list of technical terms and difficult English words is given to the students with their explanation and Japanese translation.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG03 5F461 LJ77			
<b>Course title (and course title in English)</b>	原子力環境工学 Nuclear Environmental Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science	
				Associate Professor,FUJIKAWA YOUKO	
				Institute for Integrated Radiation and Nuclear Science	
				Associate Professor,FUKUTANI SATOSHI	
				Institute for Integrated Radiation and Nuclear Science	
				Assistant Professor,IKEGAMI MAIKO	
				Institute for Integrated Radiation and Nuclear Science	
				Assistant Professor,SHIBAHARA YUJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Various wastes are generated from the use of nuclear energy, one of the key technologies to overcome the global warming, and the associated industrial activity. This course is intended to understand the type and origin of radioactive wastes, as well as the management, treatment, and final disposal of these wastes, from the viewpoint of environmental engineering.					
<b>[Course objectives]</b>					
By providing the students with the knowledge on various radioactive wastes generated by the use of nuclear energy as well as the radiological risk of such wastes, the course will enable the students to consider the future of nuclear industries based on their own judgement.					
<b>[Course schedule and contents]</b>					
Course Introduction ,1time,Course Introduction					
Nuclear disaster action program,1time,nuclear disaster action program					
Nuclear reactors,1time,Nuclear reactors					
Treatment of liquid radioactive waste,1time,Treatment of liquid radioactive waste					
Treatment of gaseous and solid radioactive waste,1time,Treatment of gaseous and solid radioactive waste					
Legislation of radioactive wastes,1time,Legislation of radioactive wastes					
Decommissioning and clearance,1time,decommissioning and clearance					
Radiological risk,1time,The risk of radiation exposure, history of radiation dose limit set by international organizations, and dose limit under different situations are discussed					
Fukushima Daiichi Nuclear Power Plant (F1) accident and nuclear disaster prevention,1time,Discuss the relation between the events in F1 and the radiation dose in the environment as well as pollution of environment. The evacuation activity conducted in Fukushima and the related lessons are summarized.					
Problems of designated waste,1time,In the aftermath of the F1 accident, municipal solid waste contaminated with radioactive cesium has been produced in 12 Prefectures, some of these wastes were classified as designated wastes (DSW). The concept of DSW is compared with that of conventional radioactive wastes.					
Geological disposal of high level radioactive wastes (HLW) and the safety assessment ,1time,Inventory, the method of disposal (critical path and nuclides), philosophy of radiological protection, etc. are discussed.					
Behavior of radionuclides in the environment and mathematical modeling of nuclide migration,1time, Behavior of radionuclides in the geosphere has governing effect on the safety of geological disposal of HLW. The behavior based on the chemical characteristics of each nuclides and mathematical modeling of their behavior are discussed.					
Behavior and qualitative/ quantitative analysis of radionuclides in the environment,1time,Behavior and qualitative/ quantitative analysis of radioactive Cs, Co, Sr, I, Se, U, Pu and Ra in the environment, and events					
----- Continue to 原子力環境工学(2) -----					

## 原子力環境工学(2)

of radioactive pollution of the environment in the past, are introduced.

The risk of radiation and the society, 1time, After the F1 accident, the risk of radiation has drawn intense attention from citizens. The risk communication methodology to facilitate the understanding of radiation is discussed.

Discussion with /between students, 1time, Discussion on issues such as lifestyle in the contaminated environment (under existing exposure situation), whether residents should return to the contaminated areas, and how to deal with siting problems of final disposal of HLW, etc..

### [Course requirements]

Basic knowledge on health physics, chemistry and earth science.

### [Evaluation methods and policy]

Attendance to the lecture plus report

### [Textbooks]

Related papers etc. will be distributed in each lecture.

### [References, etc.]

#### ( Reference books )

Related literature will be notified in each lecture.

#### ( Related URLs )

(None)

### [Study outside of class (preparation and review)]

NOt specified.

### ( Other information (office hours, etc.) )

None

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG03 6F468 SJ16				
<b>Course title (and course title in English)</b>	環境微量分析演習 Environmental Organic Micropollutants Analysis Lab.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SHIMIZU YOSHIHISA Graduate School of Engineering Associate Professor, MATSUDA TOMONARI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
There is increasing concern about proper risk evaluation and management of hazardous chemicals such as dioxins and endocrine disruptors. To manage this problem, it is necessary to understand analytical methods and toxicity of those hazardous chemicals. In this class, lectures and experiments will be carried out about chromatography, bioassays and mass spectrometry.					
<b>[Course objectives]</b>					
Understand about principle and practical techniques of chromatography. Understand about principle of several bioassays.					
<b>[Course schedule and contents]</b>					
HPLC -How to separate it-, 3times, Learn about principle and practice of HPLC separation. How do you choose columns, solvents and detectors? How to improve peak separation? Fractionation and Purification by using HPLC, 3times, Learn about practical techniques of fractionation and purification using HPLC. LC/MS/MS, 5times, Learn about principle and practice of LC/MS/MS analysis. Understand about 3 different scan modes, full scan, daughter scan and MRM. How to make an analytical method in a refined way for substances of your interest. Bioassays, 4times, Lecture about several bioassays which are used for evaluation of environmental toxicity, and discuss about how to identify toxic compounds in environment by using HPLC in combination with bioassays.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
It is required to attend all 3 days for lectures and experiments. Attendance and reports are considered for grading.					
<b>[Textbooks]</b>					
Handouts are distributed.					
<b>[References, etc.]</b>					
( Reference books )					
Daniel C. Harris: Quantitative Chemical Analysis ISBN-13: 978-1-4292-3989-9					
Continue to 環境微量分析演習(2)					

## 環境微量分析演習(2)

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### [Study outside of class (preparation and review)]

We hope active participation of students. It is welcome that participants additionally try to analyze the sample their own interest.

### ( Other information (office hours, etc.) )

This intensive course is useful especially for students who usually use or intend to use HPLC and LC/MS/MS for their research.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG03 6F470 SB16			
<b>Course title (and course title in English)</b>	環境工学先端実験演習 Advanced Enivironmental Engineering Lab.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, ITOH SADAHIKO Graduate School of Engineering Professor, YONEDA MINORU Graduate School of Engineering Professor, TAKAOKA MASAKI Graduate School of Engineering Assistant Professor, KUSAKABE TAKETOSHI Part-time Lecturer, YASOJIMA MAKOTO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.3,4	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Analytical methods to characterize environmental samples are learnt through practical training including site visit to other research institute or analytical company.					
<b>[Course objectives]</b>					
To promote your own research by learning each research method with wide vision					
<b>[Course schedule and contents]</b>					
<p>1.Guidance and Safety Education: Ito The content of subject and safety education for the following experiment are explained.</p> <p>2-3. Quantitative analysis of elements: Yoneda + Nippon Instruments Corporation The principle of multielement analysis is explained and practical training of ICP-AES or ICP-MS machine is conducted.</p> <p>4-5. Gas and Liquid Chromatography: Shimadzu corporation. The principle of Gas and Liquid Chromatography is explained.</p> <p>6-7. Qualitative analysis of elements: Takaoka + Rigaku The principle of X-ray based methods is explained and practical training of one or two X-ray based machine is conducted.</p> <p>8-10.Qualitative and quantitative analysis of organic compounds: Kusakabe, Yasojima Qualitative and quantitative analysis of organic compounds such as mass spectrometry is explained and practical training of LC-MS etc. is conducted.</p> <p>11. Bioassey: Hiyoshi Corporation Qualitative and quantitative analysis of toxic compounds by bioassey is explained.</p> <p>12. Making reports This time is for making reports.</p>					
Continue to 環境工学先端実験演習(2)					

## 環境工学先端実験演習(2)

13-14.Site visit(Shimadzu Corporation. Shimadzu techno-research inc., Horiba Ltd.)

Site visit to research institute or analytical company

15. Feedback

Questions about reports etc. in each class from students will be answered by e-mail etc.

### [Course requirements]

None

### [Evaluation methods and policy]

Attendance at the class(50%) and report subjects(50%) are evaluated.

### [Textbooks]

Instructed during class

### [References, etc.]

( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Students are required to study on each of topics after lecture by using the materials distributed.

### ( Other information (office hours, etc.) )

Because analytical devices are limited, we may restrict the number of students.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 7F472 SJ16				
<b>Course title (and course title in English)</b>	環境工学実践セミナー Seminar on Practical Issues in Urban and Environmental Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Acquire practical knowledge and ability required for researchers and engineers involved in environmental engineering and environmental management. Specifically, participate in seminar series or symposium designated by major, conducted by international organizations, government, local governments, private enterprises, research institutes, NPOs and other practitioners / researchers.					
<b>[Course objectives]</b>					
To					
<b>[Course schedule and contents]</b>					
<p>Task assignment (1 time) Select an academic society that will make a research presentation, and set a task.</p> <p>Research / research (5 times) Investigate and research on the set issues.</p> <p>Presentation of research (1 time) Do research presentations at academic societies etc.</p> <p>Task assignment (1 time) Select an academic society that will make a research presentation, and set a task.</p> <p>Research / research (5 times) Investigate and research on the set issues.</p> <p>Presentation of research (1 time) Do research presentations at academic societies etc.</p> <p>Report creation (1 time) We prepare a report that summarizes the contents released at academic societies, etc. and submit.</p>					
<b>[Course requirements]</b>					
None					
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Continue to 環境工学実践セミナー(2)					

## 環境工学実践セミナー(2)

### [Evaluation methods and policy]

Submit a report describing the achievement record (participation in seminars and symposia etc), and credit the unit by comprehensive evaluation by the department head and academic supervisor.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Follow the instructions of your supervisor.

### ( Other information (office hours, etc.) )

Details will be given at the guidance.

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 7P475 PB16				
<b>Course title (and course title in English)</b>	都市環境工学ORT ORT on Urban and Environmental Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<p>Practicing research subjects related to urban environmental engineering and academic presentations of research results to cultivate advanced expertise and ability to develop new research fields and acquire the practical ability required as researchers and engineers. Specifically, we will hold research presentations at academic conferences and laboratory seminars held in Japan and abroad, participate in various seminars / symposia / workshops, participate internships at companies and research institutes in Japan and overseas.</p>					
<b>[Course objectives]</b>					
To					
<b>[Course schedule and contents]</b>					
<p>Contents determination (1 time) Select seminars, academic presentations, internship etc. where each student participates.</p> <p>Research / Research (13 times) Acquire specialized knowledge and experience through seminars, academic presentations and internships.</p> <p>Report creation (1 time) Seminar, conference presentation, internship etc, under the guidance of the teacher in charge, submit it as a report.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
The department head and the supervisor instructor will comprehensively evaluate the record describing the achievement record, thereby crediting the unit.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
<p>( Reference books ) Introduced during class</p>					
Continue to 都市環境工学ORT(2)					

## 都市環境工学ORT(2)

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### [Study outside of class (preparation and review)]

Follow the instructions of your supervisor.

### ( Other information (office hours, etc.) )

Details will be given at the guidance.

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG03 7U401 PJ16				
<b>Course title (and course title in English)</b>	都市環境工学特別セミナー A Seminar on Urban and Environmental Engineering A, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Students give reports and presentations, have interactive discussions with the supervisors on research themes. The research theme should be related to the circular economy, recognition and identification of social structure, investigation and analysis of the actual state of circulation of resources and energy in real society, elucidation and modeling of mechanisms that govern various phenomena related to resources and energy circulation.					
<b>[Course objectives]</b>					
To					
<b>[Course schedule and contents]</b>					
Explanation of class implementation method and presentation of examples of research subjects (1 time) We will explain how to implement lessons and examples of issues related to recycling social structure.					
Setting assignment (1 time) Each student sets research subjects related to the recycling-based social structure etc.					
Presentation of task (1 time) We will present the significance and research plan of the research topic set up by the teachers in charge and discuss the contents.					
Research / Research (9 times) Investigate and research on the tasks that have been set.					
Presentation of research (1 time) We will present the results of the survey and research in front of the teachers in charge and give a question and answer.					
Report creation (2 times) Considering points pointed out in the research presentation etc, summarize the contents of the survey and research into a report and submit.					
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Continue to 都市環境工学特別セミナー A(2)					

## 都市環境工学特別セミナー A (2)

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### [Course requirements]

None

### [Evaluation methods and policy]

The results will be evaluated comprehensively.

### [Textbooks]

Handout will be given accordingly.

### [References, etc.]

#### ( Reference books )

Handout will be given accordingly.

### [Study outside of class (preparation and review)]

Good preparation and enough review are required.

### ( Other information (office hours, etc.) )

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 7U403 PJ16				
<b>Course title (and course title in English)</b>	都市環境工学特別セミナー B Seminar on Urban and Environmental Engineering B, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOSHITA KAZUYUKI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Students give reports and presentations, have interactive discussions with the supervisors on research themes. The research theme should be related to environmental risk assessment. It is necessary to identify social structure that environmental risk arises, propagate and propagate. Also, it would need to identify various risk phenomena found in real world, elucidate mechanisms that control environmental risk events. We give tasks on academic and practical research themes related to modeling, management and reduction of environmental risks, communication of risk information, etc.					
<b>[Course objectives]</b>					
To					
<b>[Course schedule and contents]</b>					
Explanation of class implementation method and presentation of examples of research subjects (1 time) We will explain how to implement lessons and examples of tasks related to environmental risk assessment.					
Setting assignment (1 time) Each student sets research subjects related to environmental risk assessment etc.					
Presentation of task (1 time) We will present the significance and research plan of the research topic set up by the teachers in charge and discuss the contents.					
Research / Research (9 times) Investigate and research on the tasks that have been set.					
Presentation of research (1 time) We will present the results of the survey and research in front of the teachers in charge and give a question and answer.					
Report creation (2 times) Considering points pointed out in the research presentation etc, summarize the contents of the survey and research into a report and submit.					
フィードバックを送信 履歴 保存済み コミュニティ					
----- Continue to 都市環境工学特別セミナー B (2) -----					

都市環境工学特別セミナー B (2)

**[Course requirements]**

None

**[Evaluation methods and policy]**

The results will be evaluated comprehensively.

**[Textbooks]**

Handout will be given accordingly.

**[References, etc.]**

**( Reference books )**

Handout will be given accordingly.

**[Study outside of class (preparation and review)]**

Good preparation and enough review are required.

**( Other information (office hours, etc.) )**

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 6X321 LE24 G-ENG55 6X321 LE24				
<b>Course title (and course title in English)</b>	環境リスク管理リーダー論 Lecture on Environmental Risk Management Leader		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SHIMIZU YOSHIHISA Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
In this class, we will give lectures on theory of risk analysis, risk identification, risk assessment, risk evaluation, and risk reduction and avoidance in the field of urban human security including human health risk and ecological risk. The main purpose of this lecture is to provide students basic viewpoint and knowledge required for environmental leaders who can practically solve environmental issues occurring in developing countries, showing several international environmental projects as practical case works.					
<b>[Course objectives]</b>					
The main purpose of this lecture is to provide students with the basic viewpoint and knowledge required for environmental leaders able to practically solve environmental issues occurring in developing countries, focusing on several international environmental projects as practical case works.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, In this introductory lecture, the current situation and problems of the environment in Asian developing countries are explained, and basic ideas for their improvement measures are given together with fundamental terminologies. Energy and Environment, 1time, View point and commitment to rural environmental issues, 1time, Disaster Risk Management and Grass-roots International Cooperation, 1time, Environmental Risk Assessment and Risk Communication, 1time, Water, Sanitation and Solid Waste Management for Developing Countries, 1time, Presentations and Discussions, 2times, Japan's Lessons on Economy and Development, 1time, Solid Waste Management, 1time, Ensuring Sustainability in Water Supply and Sewerage Sector, 1time, Water Supply and Human Security, 1time, Impending Issues in Lake Biwa-Yodo River Water Management and the Basin Governance, 1time, Environment and Sanitary Engineering Research International Session, 1time, Poster Presentation in Environment and Sanitary Engineering Research Symposium, 1time,					
<b>[Course requirements]</b>					
None					
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Continue to 環境リスク管理リーダー論(2)					

## 環境リスク管理リーダー論(2)

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### [Evaluation methods and policy]

Participation, Oral and Poster Presentation, and Report

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

To be announced at class.

### ( Other information (office hours, etc.) )

To be announced at class about poster presentation in Environment amp Sanitary Engineering Research Symposium.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5A856 LJ74				
<b>Course title (and course title in English)</b>	居住空間計画学 Dwelling Planning		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YANAGISAWA KIWAMU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>We will discuss the principles of composition and reorganization of living spaces based on a multifaceted study of human settlements. Specifically, we look at research based on descriptive analysis of personal residential experiences in detail, which appear to significantly influence the composition of residential spaces. In addition, we will conduct exercises using the "residential experience interview" method and discuss the impact of residential experience on the formation of living environment and residential life.</p>					
<b>[Course objectives]</b>					
<ul style="list-style-type: none"> <li>• Students will learn the basic method of "residential experience interview" to understand the various forms of residence corresponding to differences in society and lifestyles.</li> <li>• They will be able to examine, through concrete cases, how the formation of living spaces is regulated by residential views based on personal and social residential experiences.</li> <li>• They will develop diverse perspectives and proposals on living spaces that will contribute to the diversification and improvement of housing quality in the real world.</li> </ul>					
<b>[Course schedule and contents]</b>					
<p>Overview (1 Class)</p> <ul style="list-style-type: none"> <li>• Lecture Overview/Course Guidance/Themes for Report Assignments and</li> </ul> <p>Basic Theory of Living Space Planning (2 Classes)</p> <ul style="list-style-type: none"> <li>• Modern Dwellings Based on Experience Descriptions of Residential Spaces</li> <li>• Learning from Residential Experience Interviews</li> </ul> <p>Exercise 1: Residential Space Experience Description (4 Classes)</p> <ul style="list-style-type: none"> <li>• Presentation of Report Assignment</li> <li>• Group work on Experience Descriptions of Residential Spaces based on the above</li> </ul> <p>Exercise 2: Changes in Modern Dwellings and Diversity of Living Styles (7 Classes)</p> <ul style="list-style-type: none"> <li>• Interim Presentation of Report Assignment</li> <li>• Exercise on the Transition of Modern Residence and the Diversity of Living Styles from the Perspective of Other People's Experience Descriptions of Residential Spaces</li> </ul> <p>Summary and Discussion (1 Class)</p> <ul style="list-style-type: none"> <li>• Summary and Discussion of Lectures and Presentations</li> </ul> <p>Late August: Submission of Report Assignment</p>					
Continue to 居住空間計画学(2)					

## 居住空間計画学(2)

### [Course requirements]

Students must have the basic ability to draw and decipher residence ground plans.

A basic background in architectural and residential planning is preferred, but graduate students in different disciplines are welcome to take the course.

### [Evaluation methods and policy]

Continuous assessment (40%) and Assignment Report      Score (60%)

Continuous assessment is based on the presentation and feedback of Report      .

- Failing to submit, present, or provide feedback for either of the Reports in class will be considered a failure.
- Reports that fail to meet the theme questions will be considered a failure.
- Reports with original ideas and a detailed discussion will be given a higher grade.

### [Textbooks]

Kinamu Yanagisawa, Akane Mizushima, Takashi Ikejiri "住経験インタビューのすすめ" (Nishiyama Uzo Kinen Bunko, 2018) ISBN: 49099395040

### [References, etc.]

#### ( Reference books )

Shigebumi Suzuki "住まいを語る：体験記述による日本住居現代史" (Kenchiku Shiry? Kenky?sha, 2002), Uzo Nishiyama "住み方の記(改訂版)" (Chikuma Sosho, 1978), Masahiko Kishi "断片的なものの社会学" (Asahi Press, 2015)

### [Study outside of class (preparation and review)]

As a class exercise, students will conduct interviews with each other and with their parents or grandparents about their past residential experiences, and create a report analyzing and discussing the results.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG04 5B013 LJ74				
<b>Course title (and course title in English)</b>	建築設計特論 Theory of Architectural Design, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,HIRATA AKIHISA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
We will discuss the various possibilities of modern architecture with reference to related discourses and examples. In particular, we will discuss the implications of the transition from mechanistic architecture in the 20th century to life-theoretic architecture in the 21st century.					
<b>[Course objectives]</b>					
Understand the possibilities of theory linked to the reality of architectural design, and acquire the ability to think architecturally in a new era.					
<b>[Course schedule and contents]</b>					
<p>Biological architecture (3 times) Discuss the possibility of supple and inclusive architectural principles as an alternative to mechanistic architectural principles.</p> <p>Architectural geometry (twice) Discusses the modern significance of geometry and its practical potential in architectural design.</p> <p>Architectural nature (twice) Discuss the possibilities and techniques of rethinking architecture as a fusion rather than a conflict with nature.</p> <p>Meaning of architecture (twice) Discuss how we can recapture the problem of meaning in modern architecture.</p> <p>Modern wisdom and architecture (5 times) We will discuss the possibility of new architectural thinking with reference to modern wisdom that re-questions the state of modern architecture.</p> <p>Learning achievement evaluation (1 time) Evaluate learning achievement.</p>					
<b>[Course requirements]</b>					
None					
Continue to 建築設計特論(2)					

## 建築設計特論(2)

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### [Evaluation methods and policy]

Comprehensive evaluation through attendance, presentations, reports, participation in discussions, submissions, etc.

### [Textbooks]

Distribute necessary materials according to the theme.

### [References, etc.]

#### ( Reference books )

Instruct reference books as the class progresses.

### [Study outside of class (preparation and review)]

instruct as appropriate

### ( Other information (office hours, etc.) )

Check KULASIS for more information on office hours.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B014 LJ74				
<b>Course title (and course title in English)</b>	建築環境計画論 Theory of Architectural and Environmental Planning I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MIURA KEN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Japan will have a very super aging society. In order to maintain the vitality of society, a plan for building and environment that extends healthy life expectancy is required. This class explain the cases of international medical welfare architecture and human environment design focusing on physiological psychological indicators to gain an advanced understanding relation between human well-being and architectural planning and design.					
<b>[Course objectives]</b>					
In this class students acquire subjective thinking abilities and advanced planning skills to discover and solve problems themselves through discussions and exercises.					
<b>[Course schedule and contents]</b>					
1 class: This class explain the position and goals of this lecture and points to be noted in term.					
2 classes: Human-Environment Design and Research: medical welfare architecture ,These classes deepen students' understanding of trends and research techniques incorporating human environmental design.					
4 classes:New building planning: Learn examples of new architectural plans, planning methods and planning concepts, and learn perspectives for planning new architecture suitable for the next 100 years.					
4 classes: New Building Types : Learn about new building types, their state-of-the-art planning methods and planning concepts, and learn perspectives for planning new architecture suitable for the next 100 years.					
4 classes : New Urban Projects: Learn about urban projects based on new ideas, learn about their cutting-edge planning methods and planning concepts, and learn perspectives for planning architecture suitable for the next 100 years.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on written reports and presentation					
<b>[Textbooks]</b>					
Classes will make use of printed handouts and projected slides.					
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Continue to 建築環境計画論 (2)					

## 建築環境計画論 (2)

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### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Subjects will be given written reports to be completed outside class, with corresponding presentations in class.

### ( Other information (office hours, etc.) )

Appointments can be made by email.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B016 LJ74				
<b>Course title (and course title in English)</b>	建築論特論 Theory of Architecture, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TAJI TAKAHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,2times, ,2times, ,1time, ,2times, ,2times, ,2times, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>					
<b>Course title (and course title in English)</b>	建築都市文化史学特論 History of Architecture and Environmental Design		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,IWAMOTO KAORU	
<b>Target year</b>	1st year students or above	<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
巡礼を共通テーマとして、日本の宗教空間の構造と特質について講義する。日本において聖地はどのようにデザインされてきたか、どのような主体が関与してきたかを考察する。					
<b>[Course objectives]</b>					
具体的な聖地の分析を通して、空間の読解方法や史料の扱い方などを身につける。					
<b>[Course schedule and contents]</b>					
第1回 ガイダンス 第2～4回 日本の観音巡礼 西国三十三所・坂東三十三所・秩父三十四所の成立と展開について講義する。 第5～7回 参詣曼荼羅 善峯寺と成相寺を中心に参詣曼荼羅の読解を行う。善峯寺の見学も予定。 第8～10回 伊勢神宮と聖地 伊勢神宮の摂末社巡拝および天岩戸について講義する。 第11～13回 写し巡礼 京都や江戸の都市巡礼、および境内地への写し巡礼、巡礼建築について講義する。御室八十八所の見学も予定。 第14回 巡礼の近代 巡礼の近代以降の変容、および新たに作られた巡礼・聖地について講義する。 第15回 フィードバック					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
レポートにて評価する。					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
Introduced during class					
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Continue to 建築都市文化史学特論(2)					

## 建築都市文化史学特論(2)

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### [Study outside of class (preparation and review)]

レポート執筆には対象とする聖地の訪問を必須とする。  
講義中で取り上げた聖地を実際に訪問することが望ましい。

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B019 LJ74				
<b>Course title (and course title in English)</b>	建築プロジェクトマネジメント論 Project Management		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KANETA TAKASHI Graduate School of Engineering Associate Professor, NISHINOSAYAKA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Overview of Project Management and Construction Management in Japan. Lecture and discussion.					
<b>[Course objectives]</b>					
To acquire the knowledge and the ability of project management.					
<b>[Course schedule and contents]</b>					
1-2. PM/CM Basic knowledge of project management and construction management. 3-8. PM/CM Projects Real projects and success in project management and construction management. Professional applications. 9-10. Method of PM/CM Methods and tools in project management and construction management. 11-12. Topics of PM/CM Topics of project management and construction management in Japan and overseas. 13-15. Discussion on PM/CM Discussion and feedback on project management and construction management.					
<b>[Course requirements]</b>					
Construction Engineering and Management I and II (undergraduate program) should be mastered.					
<b>[Evaluation methods and policy]</b>					
Report. Attendance of lectures and site visit are also evaluated.  Absolute evaluation (raw score) Attendance and individual reports will be assessed on the basis of achievement level for course goals. - Those who are absent more than four times will not be credited. - Students will submit all reports. The reports with originality will be given a high score.					
Continue to 建築プロジェクトマネジメント論(2)					



## 建築プロジェクトマネジメント論(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Read the material introduced in the class.

### ( Other information (office hours, etc.) )

Contact to:

kaneta@archi.kyoto-u.ac.jp

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B032 LJ74					
<b>Course title (and course title in English)</b>	応用固体力学 Applied Solid Mechanics I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOSAKI MAKOTO Graduate School of Engineering Associate Professor,		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Fundamentals of stress tensor, strain tensor, and constitutive relations are discussed. Based on these concepts, boundary value problem is formulated. Finite deformation and nonlinear constitutive relations are also discussed.						
<b>[Course objectives]</b>						
To learn fundamentals of solid mechanics						
<b>[Course schedule and contents]</b>						
1-4. Stress tensor and strain tensor: Fundamentals of tensor analysis, stress tensor, strain tensor, constitutive relation. 5-7. Conservation laws and boundary value problem: 8-10. Geometric nonlinearity: Stress and strain tensors considering finite deformation. 11-14. Material nonlinearity: Fundamentals of nonlinear elastic and elastoplastic constitutive relations. 15. Final examination/ Learning achievement evaluation						
<b>[Course requirements]</b>						
Structural mechanics, linear algebra, vector analysis						
<b>[Evaluation methods and policy]</b>						
Final examination						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Introduced during class						
<b>[Study outside of class (preparation and review)]</b>						
Explained in the class						
( <b>Other information (office hours, etc.)</b> )						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG04 5B033 LJ74				
<b>Course title (and course title in English)</b>	応用固体力学 Applied Solid Mechanics II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOSAKI MAKOTO Graduate School of Engineering Associate Professor,	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Based on displacement method, approximate formulations for beams, plates shells are discussed.					
<b>[Course objectives]</b>					
To learn fundamentals of solid mechanics					
<b>[Course schedule and contents]</b>					
1-3. Plate theory: Displacement-based thick and thin plate theories are formulated from the basic equations for 3D continua. 4-10. Rod theory: Based on the virtual work principles, St. Venant's and Wagner's torsion theories are derived. 3D beam theory including bending and shear is also presented. 11-14. Shell theory: Arch and cable theories are discussed. Based on membrane theory, formulations for shell theory is presented. 15. Final examination/ Learning achievement evaluation					
<b>[Course requirements]</b>					
Structural mechanics, linear algebra, vector analysis					
<b>[Evaluation methods and policy]</b>					
Final examination					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
Explained in the class					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG04 5B035 LJ74				
<b>Course title (and course title in English)</b>	人間生活環境デザイン論 Design Theory of Architecture and Human Environment		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KANKI KIYOKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
, 1 times, , 6times, , 2times, , 5times, , 1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG04 5B036 LJ74				
<b>Course title (and course title in English)</b>	建築史学特論 History of Japanese Architecture		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TOMISHIMA YOSHIAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Using contemporary artefacts and textual sources, this course will explore the relationships between architecture and Buddhist teachings/ritual from the ancient period to the middle ages.					
<b>[Course objectives]</b>					
The objective of this course is to acquire research skills related to the investigation of architectural history topics.					
<b>[Course schedule and contents]</b>					
Introduction and orientation on architecture and Buddhism: 1 session The architecture of esoteric Buddhism (part 1)-On the relationship between the mandala and architectural structure and space: 5 sessions The architecture of esoteric Buddhism (part 2)-On the relationship between esoteric ritual and spatial composition: 4 sessions The architecture of Amida devotion-On the relationship between the structure of Amida halls and devotion: 4 sessions Revision and feedback: 1 session					
<b>[Course requirements]</b>					
Ability to read Japanese ancient documents is necessary.					
<b>[Evaluation methods and policy]</b>					
Mid-term reports and final report.					
<b>[Textbooks]</b>					
Instructed during class					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
It is desirable to observe the historic architecture which I took away by a class.					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG04 5B037 LJ74				
<b>Course title (and course title in English)</b>	建築設計力学 Design Mechanics for Building Structures		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKEWAKI IZURU Graduate School of Engineering Associate Professor, KOHEI FUJITA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Basic mechanics and inverse problem for design of building structures are explained. Structural optimization methods are also presented. Rational structural design approaches are introduced in place of conventional try-and-error approaches.					
<b>[Course objectives]</b>					
Obtain the knowledge on basic mechanics for design of building structures. Also obtain advanced knowledges on new theories and methodologies of structural optimization and inverse-problem formulations.					
<b>[Course schedule and contents]</b>					
<p>Concept of inverse problem, 1 class, Examples of inverse problem in terms of shear building models</p> <p>Hybrid inverse problem of structural systems, 1 class, Examples of hybrid inverse problem in vibration and classification of hybrid inverse problems. The solution procedure of hybrid inverse mode problems is discussed.</p> <p>Strain-controlled design method for moment-resisting frames, 1 class, Simple examples are used for understanding fundamental concepts of strain-controlled design.</p> <p>Inverse problem via design sensitivity analysis, 1 class, An inverse problem formulation via design sensitivity analysis (direct method) is explained.</p> <p>Earthquake-response constrained design, 1 class, A method of earthquake-response constrained design for shear building models is explained. Design loads in terms of the design response spectrum are used in the design method.</p> <p>Performance-based Design, 1 class, A design methodology based on the concept of performance-based design is explained.</p> <p>Exercise 1, 1 class, Exercise on inverse problems.</p> <p>Fundamentals of mathematical programming, 2 classes, Fundamentals of mathematical programming methods are explained. Linear and nonlinear programming methods are introduced and some examples are presented.</p>					
Continue to 建築設計力学(2)					

## 建築設計力学(2)

Design sensitivity analysis, 1 class,  
Basic methods of sensitivity analysis for computing derivatives (sensitivity coefficients) of static responses and frequencies of free vibration with respect to variations of design parameters are explained.

Application to optimization of framed structures, 1 class,  
Application of mathematical programming methods to optimization of framed structures is presented.

Optimal design for base isolation and structural control , 2 classes,  
Several methods for optimal design of structures using base isolation and structural control are explained.

Exercise 2, 1 class,  
Exercise on structural optimization

Confirmation of the Learning Degree, 1 class,

### [Course requirements]

Mechanics of Building Structures, Basic Linear Algebra, Basic Calculus

### [Evaluation methods and policy]

Grading is based on the examination at the end of semester.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Design Mechanics and Control Dynamics of Building, Architectural Institute of Japan, 1994.

### [Study outside of class (preparation and review)]

Solve the exercises presented in the first class in parallel to the class advancement.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B038 LJ74				
<b>Course title (and course title in English)</b>	人間生活環境認知論 Theory of Cognition in Architecture and Human Environment		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,ISHIDA TAIICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Based on human visual perception in the living environment, lectures are given on fundamental concepts of visual environment design. Additionally, the basic matters and latest trends of related illuminating and color engineering will be explained. Students' presentations and class discussions will be adopted in order to obtain proficiency in understanding.					
<b>[Course objectives]</b>					
Understanding the human visual perception in the living environment, and being able to consider the problem of the visual environment from the basics by applying knowledge, such as visual perception, illuminating engineering, color engineering. Additionally, acquiring the knowledge and the fundamental concept for designing a visual environment that is suitable for human beings.					
<b>[Course schedule and contents]</b>					
1. Introduction (1 time) Visual environment and human beings Light and color of living environment  2. Description of light and color (2 times) Photometry and colorimetry system Development of color system Perception of light and color in the environment  3. Visual perception and its theory (1 time) Perception of brightness and color of a surface Spatial perception Theory of visual perception  4. Design of clear vision (1 time) Visibility Light source and its characteristics Color rendering  5. Design of lighting environment (2 times) Psychological evaluation of lighting environment Sense of brightness and activity of an illuminating space Effect of colored light illumination Light and physiological response					
Continue to 人間生活環境認知論(2)					



## 人間生活環境認知論(2)

Examples of lighting

6. Visual function of seeing (1 time)

Visual field and eye movement

Central vision and peripheral vision

Visual search

7. Foundation of visual and color information (1 time)

Classification/search by color

Color category

Changes in color according to viewing conditions

8. Diversity of visual characteristics (1 time)

Visual impairment

Effect of aging

Color vision deficiency

Universal design

9. Psychology of color (1 time)

Color psychology

Color scheme

Color in architectural environment

10. Student assignment presentation (4 times)

Student presentations and discussions on subjects of visual environment surveys will be conducted.

### [Course requirements]

None

### [Evaluation methods and policy]

Report assignments, student presentations, and points (attendance and participation in class) are evaluated comprehensively.

### [Textbooks]

The lecture materials will be delivered in class.

### [References, etc.]

#### ( Reference books )

Reference books are introduced in class.

### [Study outside of class (preparation and review)]

students are encouraged to deepen their understanding by reviewing each lecture. Students will also be required to reconsider our visual environments by applying the knowledge acquired in this course.

Continue to 人間生活環境認知論(3)

### 人間生活環境認知論(3)

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#### ( Other information (office hours, etc.) )

Questions are accepted during and after class or via e-mail.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B040 LJ74				
<b>Course title (and course title in English)</b>	構造解析学特論 Analysis of Structures, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOSAKI MAKOTO Graduate School of Engineering Associate Professor,	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Fundamentals of finite element method (FEM) are presented for based on variational and energy principles. Formulations are derived for 2D and 1D finite elements. Basic theories and algorithms for nonlinear FEM are also presented.					
<b>[Course objectives]</b>					
Understanding of fundamentals of FEM					
<b>[Course schedule and contents]</b>					
1-2. Fundamentals of FEM: Fundamental theories and concepts are presented. As a concrete example, formulations for 2D triangle element are derived. 3-4. Isoparametric and structural elements: Isoparametric and structural elements are presented. 5-6. Displacement method and stress method: Displacement method and stress method are presented, wherein displacement and stress are respectively selected as unknown variables. Based on Lagrange's multiplier method, hybrid displacement and stress methods are also presented. 7-9. Fundamentals of nonlinear FEM: Fundamentals of nonlinear FEM are presented. Based on Newton's method, basic theories and algorithms are presented for solving quasi-static and dynamic problems. 10-11. Elastoplastic and buckling analysis: Basic theories and algorithms for elastoplastic analysis and buckling analysis are presented. 12-14. Nonlinear beam elements: Nonlinear beam elements are formulated. Both geometric and material nonlinearities are discussed. 15. Final examination/ Learning achievement evaluation					
<b>[Course requirements]</b>					
Applied solid mechanics					
<b>[Evaluation methods and policy]</b>					
Final examination					
<b>[Textbooks]</b>					
Not used					
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Continue to 構造解析学特論(2)					

## 構造解析学特論(2)

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### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Explained in the class

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG04 5B043 LJ74			
<b>Course title (and course title in English)</b>	コンクリート系構造特論 Concrete Structures, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NISHIYAMA MINEHIRO Graduate School of Engineering Associate Professor, TANI MASANORI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course will cover the structural design theory of concrete building structures (reinforced concrete buildings, steel-reinforced concrete buildings, prestressed concrete buildings, etc.), based on material theory and structural mechanics theory relating to concrete and steel. It will explain the rules for the composition of hardened concrete under multi-axial stresses and applications for methods of structural analyses such as the finite element method. Lectures will explain the relationship between properties related to durability (such as concrete carbonation and salt erosion) and concrete mixing, and describe measures to extend the lives of buildings and ensure durability in aggressive environments.					
<b>[Course objectives]</b>					
To understand and use the structural design theory of concrete building structures (reinforced concrete buildings, steel-reinforced concrete buildings, prestressed concrete buildings, etc.), based on material theory and structural mechanics theory relating to concrete and steel. To understand the rules for the composition of hardened concrete under multi-axial stresses, and be able to apply it in methods of structural analyses such as the finite element method. To understand the relationship between properties related to durability (such as concrete carbonation and salt erosion) and concrete mixing, and be able to propose measures to extend the lives of buildings and ensure durability in aggressive environments.					
<b>[Course schedule and contents]</b>					
Ultimate Limit State of Concrete Structural Members (3 classes) These classes will explain the basic knowledge and design methods relating to material ductility capacity that are considered to be necessary for high earthquake-resistance in concrete structures. Specifically, these classes will describe basic theory relating to the effect of confined concrete on mechanisms resisting bending in plastic hinge regions of beams and columns, and basic mechanisms resisting shear forces. Additionally, these classes will introduce methods of calculating deformability of members based on ultimate flexural strength, ultimate shear strength, and the ratio of these strengths used in performance evaluation design method.					
Long-term Properties of Concrete Structural Members (3 classes) These lectures will explain cracks and deformation, which can cause problems for concrete members under long-term loads. Methods for assessing creep and dry-shrinkage of concrete and the influence exerted by such factors on individual member and a whole structure will be described.					
Earthquake-resistance Evaluation and Strengthening for Existing Reinforced Concrete Buildings (3 classes) These classes will explain seismic strengthening design and the construction methods used, based on the methods and results of evaluating earthquake-resistance capacity of existing reinforced concrete buildings. Evaluating buildings' strength will be described in detail, based on determination of the aging deterioration of					
----- Continue to コンクリート系構造特論(2) -----					

## コンクリート系構造特論(2)

a building based on concrete carbonation; irregularity in elevation and in plan of a building; and the deformability and ultimate strength of members. New upgrading construction methods will also be introduced.

### Post-Earthquake Diagnosis of Damaged Reinforced Concrete Buildings (3 classes)

These lectures will describe methods for determining the degree of emergency risk and of classifying the level of damage as methods for diagnosing a damaged reinforced concrete building after an earthquake. The objectives, positioning, specific procedures, and theoretical background of the evaluation methods will be explained with examples of buildings damaged by past earthquakes.

### Prestressed Concrete Structures: Design and Theory (3 classes)

These lectures will explain the behavior of prestressed concrete (PC) structures under service load and in earthquakes. PC structural member analyses, and structural design theory that uses such analysis, will be described. These lectures will describe analyses of the response of PC building structures to seismic excitations based on PC structure's deformation and stress redistribution based on concrete creep; mechanisms that resist bending and shear; and the hysteretic restoring force characteristics of members. They will also explain the structural design of PC buildings.

### [Course requirements]

Basic knowledge of concrete materials and architectural structures is assumed.

### [Evaluation methods and policy]

Results will be assessed through a combination of examination results, submitted reports, and attendance.

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

R. Park and T. Paulay 『Reinforced Concrete Structures』 ( John Wiley&Sons )

T. Paulay and N. J. Priestley 『Seismic Design of Reinforced Concrete and Masonry Buildings』 ( John Wiley&Sons )

T. Y. Lin 『Design of Prestressed Concrete Structures』 ( John Wiley&Sons )

M. P. Collins and D. Mitchell 『Prestressed Concrete Structures』 ( Prentice Hall )

The Japan Building Disaster Prevention Association 『Seismic Evaluation and Retrofit』

Other texts will be introduced in lectures.

### [Study outside of class (preparation and review)]

Active participation in lectures, with questions, is expected.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

Continue to コンクリート系構造特論(3)

## コンクリート系構造特論(3)

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B044 LJ74				
<b>Course title (and course title in English)</b>	耐震構造特論 Earthquake Resistant Structures, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,NISHIYAMA MINEHIRO Graduate School of Engineering Associate Professor,TANI MASANORI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
These lectures will discuss the basic theory, applied theory, and practical design methods associated with earthquake-resistant design of architectural structures. Lectures will cover the basic elements of earthquake-resistant design: benchmarks and strength rankings for each structural element (pillars, beams, walls, etc.) and their meaning in earthquake-resistant design; the relationship between irregularities in horizontal and elevational planes in the frame and earthquake-response; mechanisms for consuming seismic energy, and desirable structural collapse behavior. The lectures will also explain how to use the strength, rigidity, hysteresis restoring force characteristics, and equivalent viscous damping coefficient of materials and frame elements (obtained from structural testing) in earthquake-resistant design. The lectures will also describe methods of approximation such as the equivalent linearizing method, with which one can easily deal with elastic-plastic response. Appropriate exercises will be given.					
<b>[Course objectives]</b>					
To understand the basic theory, applied theory, and practical design methods associated with earthquake-resistant design of architectural structures, and how to evaluate earthquake-resistant design. To understand current earthquake-resistant design techniques in Japan and overseas (and the differences between those methods) and gain the ability to conduct earthquake-resistant design for simple real structures and evaluate earthquake-resistance.					
<b>[Course schedule and contents]</b>					
Lessons from the previous earthquakes,3times,Typical damages and their causes in the earthquakes in 1990s and 2000s are discussed. Seismic design using the capacity design concept,4times,Seismic design using the capacity design concept are discussed. The topics are Essentials of structural systems,Definition of design quantities, and Philology of capacity design. ,4times, ,4times,					
<b>[Course requirements]</b>					
Knowledge of vibration theory and knowledge concerning reinforced concrete structures is assumed.					
<b>[Evaluation methods and policy]</b>					
Results will be assessed through a combination of examination results, submitted reports, and attendance.					
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Continue to 耐震構造特論(2)					



## 耐震構造特論(2)

### [Textbooks]

Instructed during class

No other materials are specified. Material will be distributed as appropriate.

Lecture materials, exercises, etc., will be distributed through KULASIS.

### [References, etc.]

#### ( Reference books )

Some chapters from Seismic Design of Reinforced Concrete and Masonry Buildings by Paulay and Priestley will be distributed for reference.

### [Study outside of class (preparation and review)]

R. Park and T. Paulay, Reinforced Concrete Structures, John Wiley & Sons

T. Paulay and N. J. Priestley, Seismic Design of Reinforced Concrete and Masonry Buildings, John Wiley & Sons

Other texts will be introduced during lectures.

### ( Other information (office hours, etc.) )

Active participation in lectures, with questions, is expected.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B046 LJ74				
<b>Course title (and course title in English)</b>	建築振動論 Dynamic Response of Building Structures		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, HAYASHI YASUHIRO Graduate School of Engineering Associate Professor, SUGINO MINA Disaster Prevention Research Institute Associate Professor, NISHIJIMA KAZUYOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In designing earthquake-proof structures, it is important to consider the nonlinearity and coupled behavior of the construction site ground as well as the structure, and there is a need for more practical design plans. In this course, we will first study major theories related to structure earthquake response evaluation, followed by analytical methods and earthquake-proof design methods involving dynamic interactive factors related to the ground and the coupling of the structure.					
<b>[Course objectives]</b>					
To enable accurate evaluation of the behavior of buildings in earthquakes, as well as accurate evaluation of earthquake resistance.					
<b>[Course schedule and contents]</b>					
<p>Basics of frequency analysis and time-history analysis (4 classes) Based on the example of earthquake resistance evaluation in single degree of freedom systems, we will explain frequency analysis and time-history analysis in an integrated fashion, explaining the characteristics of both as well as points to bear in mind in analysis from a practical point of view.</p> <p>Structure response analysis and damping evaluation (4 classes) We will explain an evaluation method involving the damping ratio of the structure based on experiments and observations. Also, the damping evaluation method will be explained as a means of creating an earthquake response analysis model of the structure.</p> <p>Dynamic interaction between the structure and the ground (2 classes) We will discuss the relationship between the characteristics of soil springs and foundation-input-motion as expressions of dynamic interaction on the one hand, and building response on the other. Next, we will discuss the influence of differences in the ground and the foundation type upon interactive characteristics. Finally, we will explain practical analysis methods, bearing in mind dynamic interaction.</p> <p>Random vibration theory (5 classes) We will discuss the basics of random vibration theory, which evaluates the response of the structure as a stochastic quantity. In particular, we will explain linear stationary random response, non-stationary random response, and first passage theory.</p>					
Continue to 建築振動論(2)					

## 建築振動論(2)

### [Course requirements]

Basic knowledge of vibration theory (linear response in single degree of freedom systems and multiple degree of freedom systems) is required.

### [Evaluation methods and policy]

Grading is based on both attendance and reports.

### [Textbooks]

Not used

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Review contents of Earthquake Resistant Structures which is a course of undergraduate school before taking classes. Review theories explained in classes about our hour every time.

### ( Other information (office hours, etc.) )

For details of office hours, please check KULASIS.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B052 LJ74				
<b>Course title (and course title in English)</b>	構造安全制御 Control for Structural Safety		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor, IKEDA YOSHIKI Disaster Prevention Research Institute Associate Professor, KURATA MASAHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Structural safety of building structures can be improved by controlling their responses to dynamic excitation induced by earthquakes and winds. The course explains the analytical and experimental background of the advanced analysis and simulation methods such as limit-state analysis and inelastic analysis, and methodologies for actively control the responses, i.e. base isolation and structural control.					
<b>[Course objectives]</b>					
The course help students to understand the fundamental theory behind anti-seismic design and the tips for their practical application.					
<b>[Course schedule and contents]</b>					
Earthquake resistant structure, base isolation, protective systems (1) Tuned mass damper (1) Active control (1) Structures with tuned mass dampers (1) Displacement-dependent dampers (1) Velocity-dependent dampers (1) Base isolation of lateral motions (1) Dynamic characteristic evaluation of building using vibration monitoring (1) Fundamentals of seismic design (1) Simple structural performance evaluation (1) Probabilistic assessment of seismic performance (2) Actual Effect of Seismic Retrofit (2)					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
The performance of students are evaluated by the exercises provided during the lectures and the final test.					
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Continue to 構造安全制御(2)					

## 構造安全制御(2)

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### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Handouts are provided at classes.

### [Study outside of class (preparation and review)]

The students are encouraged to review the handouts. The additional instruction may be announced during the classes.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B053 LJ74				
<b>Course title (and course title in English)</b>	建築環境物理学特論 Physics in Architectural Environmental Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OGURA DAISUKE Graduate School of Engineering Associate Professor, IBA CHIEMI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>From among the architectural environment physics, we discuss the underlying theory and application of prediction and control method of heat, humidity, and air that is required when performing environmental target values of the planning and design of building equipment. From the standpoint of transport phenomena, the basic theory concerning the transport of heat, mass and momentum is lectured and the perceptions and analysis method of phenomena that can be applied to the prediction method of each physical quantity in the built environment and equipment.</p>					
<b>[Course objectives]</b>					
<p>Mechanism of transport phenomena of heat, mass and momentum in the built environment and building equipment, similarity relationship, The students acquire proficiency in the concept of balance equations, grasping the microscopic or macroscopic transport phenomena.</p>					
<b>[Course schedule and contents]</b>					
<p>General remark, 1time, The outline of lecture contents and how to proceed class are described.          Transport of momentum, 4times, the mechanism concerning the transport of momentum of isothermal fluid and explain the balance formula of momentum transport are explained. The flow of the turbulent flow field, the coefficient of friction and the wind speed distribution in the circular tube and the flat plate are explained.          Transport of heat, 5times, The mechanism relating to heat transport of fluid with temperature change and the balance formula of heat transport are explained. The heat transfer in the turbulent flow field, the temperature distribution in the circular pipe and the flat plate, the heat transfer amount of the heat exchanger, and the like are described.          Transport of mass, 4times, The mechanism concerning multicomponent fluid movement and the balance formula of the transport of each component are explained. Transportation of substances in turbulent flow field, evaporation from porous material, principle of psychrometer etc. are explained.          Academic achievement test, 1time, Academic achievement degree is confirmed.</p>					
<b>[Course requirements]</b>					
<p>It is assumed that you take undergraduate subjects such as Building Environment Engineering I, Building Facilities System.</p>					
<b>[Evaluation methods and policy]</b>					
<p>Terminal Exam.</p>					
<p style="text-align: right;">Continue to 建築環境物理学特論(2)</p>					

## 建築環境物理学特論(2)

### [Textbooks]

Transport Phenomena, R. Byron Bird, Warren E. Stewart and Edwin N. Lightfoot, John Wiley amp Sons, Inc., Revised Second Edition, 2007

### [References, etc.]

#### ( Reference books )

Supplemental textbook is instructed during lecture.

### [Study outside of class (preparation and review)]

Given instructions as required

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG04 5B054 LJ74			
<b>Course title (and course title in English)</b>	建築設備システム特論 Building Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, IBA CHIEMI Graduate School of Engineering Professor, OGURA DAISUKE	
<b>Target year</b>	1st year students or above	<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Lectures will be given on how to determine the capacity of various equipment used for air conditioning and how to design the system consistent with architectural planning. From the viewpoint of optimal design, evaluation criteria and constraints such as economy and thermal environment, physical and mathematical modeling of them, search for feasible solutions, and various optimization techniques are also described. As the basis of the above, the concept of heat and moisture balance, heat transfer around heat exchanger, transfer systems such as pipes, ducts and pumps, and theory of mass transfer with phase change such as absorption refrigerators will be explained.					
<b>[Course objectives]</b>					
Understanding the concept of thermal/mass balance and optimal design in building equipment systems					
<b>[Course schedule and contents]</b>					
<p>Introduction, 1 class Provides an overview of the lecture content and procedure.</p> <p>Design problem, 2 classes The definition of the building equipment system, the concept of equipment planning, the concept of evaluation including economy, and the necessity of the optimal planning method are explained.</p> <p>Components of building thermal system, 3 classes Basic information of thermal systems such as heat exchanger, fan, pump, refrigerating equipment and cooling tower is provided.</p> <p>Equation fitting, 2 classes A method of equation fitting from data such as temperature, pressure, and flow rate in the components of the thermal equipment system will be described.</p> <p>Optimization problem, 2 classes Formulation as an optimization problem for equipment systems.</p> <p>Optimization techniques, 2 classes Various optimization methods including the calculus method will be described.</p> <p>Exercises and calculation, 2 classes Exercises will be provided to promote better understanding of the content of the lecture.</p>					
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Continue to 建築設備システム特論 (2)					



## 建築設備システム特論 (2)

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Evaluation of achievement, 1 class  
Achievement on above items will be evaluated.

### **[Course requirements]**

The participants are required to study Environmental engineering in Architecture I (40090) , Building equipment system (40180) etc., prior to join this course.

### **[Evaluation methods and policy]**

#### **【 Evaluation method 】**

Evaluation will be based on report (60%) and class performance (40%).  
Evaluation for class performance includes presentations and submission of assignments in the lecture.

#### **【 Evaluation policy 】**

Reports and presentations are evaluated based on the achievement of the target.

### **[Textbooks]**

Design of Thermal Systems (Third Edition), W. F. Stoeker, McGRAW-HILL BOOK Co, 1989  
Other material will be distributed as needed.

### **[References, etc.]**

#### **( Reference books )**

Give instructions as needed during the lecture.

### **[Study outside of class (preparation and review)]**

Give instructions as needed.

### **( Other information (office hours, etc.) )**

Questions are accepted at occasion. Contact lecturers via email for the arrangement of office hours.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 6B062 SJ74					
<b>Course title (and course title in English)</b>	建築学特別演習 I Seminar on Architecture and Architectural Engineering, I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOSAKI MAKOTO		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
The participants are required to set a subject of study on architecture, architectural engineering and relevant areas. Research skills and common knowledge in end-cutting and/or fundamental papers are to be studied with the advice of professors. The participants are trained to understand existing established method of research and to develop new methodologies. Discussions will be made among participants to establish ability for problem finding and solution approach.						
<b>[Course objectives]</b>						
Ability to understand previous issues and how they have been solved in areas related to the student's research theme. In addition, to discover the problems and to understand the difficulties in solving them.						
<b>[Course schedule and contents]</b>						
More than 15 times of seminars and discussions.						
<b>[Course requirements]</b>						
M1 students.						
<b>[Evaluation methods and policy]</b>						
Score is evaluated by contents amp materials of presentation and by overall progress of study.						
<b>[Textbooks]</b>						
To be specified during the course.						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) To be specified during the course.						
<b>[Study outside of class (preparation and review)]</b>						
To be specified during the course.						
( <b>Other information (office hours, etc.)</b> )						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG04 6B063 SJ74					
<b>Course title (and course title in English)</b>	建築学特別演習II Seminar on Architecture and Architectural Engineering, II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOSAKI MAKOTO		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
The participants are required to set a subject of study on architecture, architectural engineering and relevant areas. Research skills and common knowledge in end-cutting and/or fundamental papers are to be studied with the advice of professors. The positioning, research findings and/or future development are discussed among participants. Through the activities, the participants are trained for the ability of proceed research by their own way.						
<b>[Course objectives]</b>						
To set goals for how the students solve problems they find in the field related to the research theme. In addition, students should be able to present the problem appropriately and acquire skills that can improve the efficiency of problem solving through discussion.						
<b>[Course schedule and contents]</b>						
More than 30 times of seminars and discussions.						
<b>[Course requirements]</b>						
M2 students.						
<b>[Evaluation methods and policy]</b>						
Score is evaluated by contents amp materials of presentation and by overall progress of study.						
<b>[Textbooks]</b>						
To be specified during the course.						
<b>[References, etc.]</b>						
( Reference books ) To be specified during the course.						
<b>[Study outside of class (preparation and review)]</b>						
To be specified during the course.						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG04 8B069 LJ74			
<b>Course title (and course title in English)</b>	建築技術者倫理 Architectural Engineer Ethics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,NISHIYAMA MINEHIRO Graduate School of Engineering Professor,HARADA KAZUNORI Graduate School of Engineering Professor,ISHIDA TAIICHIROU Disaster Prevention Research Institute Professor,MAKI NORIO Graduate School of Engineering Associate Professor,NISHINOSAYAKA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Rapid developments in science and technology in this century have made our lives surprisingly convenient and rich. On the other hand, it should be noted that misuse of science and technology results in the destruction of human life as well as the environment. This risk is held by architectural engineers.</p> <p>In this course, we will consider ethical responsibility of designers and engineers working on architectural and urban design, with the help of science, technology and engineering. We will deal with specific ethical issues during architectural, structural, environmental and utility design, as well as building production, operation, and maintenance. By discussing how we can deal with these issues, students will nurture robust senses of ethical responsibility. This course will also be meaningful for students who intend to undertake an internship because it will allow them to be aware of the responsibility for the designers and engineers (which is necessary in actual practice) in advance.</p>					
<b>[Course objectives]</b>					
Goals of this course is to promote capability of making appropriate and fair decision, by understanding the ethics and norms required for designers and engineers working on architectural and urban design.					
<b>[Course schedule and contents]</b>					
<p>Architectural Design and Ethics (5 classes)</p> <p>1. Expansion of NIMBY facility types (Appearance and regional acceptance of new "public" facilities, principle of location site selection, public legitimacy and selection rules, etc.)</p> <p>2. Risk communication when accepting NIMBY facilities locally-Focusing on waste disposal facilities and industrial waste disposal facilities (Process of location site selection, regional acceptance, ideal way of risk management and risk communication, etc.)</p> <p>3. Environmental and energy issues and architectural ethics (architecture and reuse, environmental and ethical issues and ethics, environmental consciousness and architectural technology, etc.)</p> <p>4. Ideas and technology concerning nature and architecture (forest resources and architecture, consideration and control of nature, architectural reuse technology and concepts, etc.)</p> <p>Structural Design and Ethics (6 classes)</p> <p>The fraudulent earthquake-resistance issue brought about real ethical problems, and the safety and security of a building as secured by its architectural structure is extremely important. It is imperative that structural</p>					
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Continue to 建築技術者倫理(2)					

## 建築技術者倫理(2)

designers have a sense of engineering ethics. Through consideration of examples, roleplaying, and debates, we will think about what kinds of norms structural engineers should adhere to.

1. Adding water to pre-mix concrete (AIJ Ethics Committee e-learning), the value of human life, etc.
2. The Building Standards Act as a minimum standard? (AIJ WG Report on Minimum Standards)
3. As expected seismic motion increases, how should engineers design earthquake ground motion? The case of Uemachi fault zone earthquakes.
4. Problems concerning setting strength standards and earthquake reinforcement (determination based on earthquake-resistance grades and seismic index).

### Environment & Equipment Design and Ethics (3 classes)

Environmental consideration of architecture including utility design plays an important role in reducing environmental impact during the lifecycle of buildings. Accordingly, ethical responsibility of engineers involved in architectural environment and utility design have been increased. We will consider the ethical issues through the following examples.

1. Understanding community noise and utility noise issues, and discuss their ethical issues and mitigation
2. Introduction of recent development on energy-saving techniques for buildings and consider measures against global warming.

Student Assessment - 1 class: Assessment of the level of learning achieved.

### [Course requirements]

None

### [Evaluation methods and policy]

Based on written reports

### [Textbooks]

Instructed during class  
Printed materials may also be distributed.

### [References, etc.]

#### ( Reference books )

Introduced during class  
Introduced during class

### [Study outside of class (preparation and review)]

Instructed during class

### ( Other information (office hours, etc.) )

Active participation in lectures is expected in terms of questions and the expression of opinions.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 7B071 PJ74					
<b>Course title (and course title in English)</b>	インターンシップ （建築） Internship I, Architectural Design Practice		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KANKI KIYOKO Graduate School of Engineering Associate Professor, IWAMOTO KAORU		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
Guidance, 2時間times, Project Explanation, 8時間times, Briefing and Data Collection, 12時間times, Basic Design, 80時間times, Practical Design, 80時間times, Report, 2時間times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG04 7B073 PJ74				
<b>Course title (and course title in English)</b>	インターンシップ （建築） Internship II, Architectural Design Practice		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KANKI KIYOKO Graduate School of Engineering Associate Professor, IWAMOTO KAORU	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Guidance, 2時間times, Project Explanation, 8時間times, Briefing and Data Collection, 12時間times, Basic Design, 80時間times, Practical Design, 80時間times, Report, 2時間times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG04 7B075 PJ74				
<b>Course title (and course title in English)</b>	建築設計実習 Architectural Design Practice		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, HIRATA AKIHISA	
<b>Target year</b>		<b>Number of credits</b>	6	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.4,5,Tue.4,5,Wed.4,5,Thu.1,Fri.3,6	<b>Class style</b>	Practical training		<b>Language of instruction</b> Japanese
<b>[Overview and purpose of the course]</b>					
By assisting the practical work of design and supervision with the actual project carried out by the teacher who is a practitioner of architectural design as an issue, we will acquire practical knowledge and skills from planning to realization in architectural design. Our faculty members who have abundant practical experience and are qualified as first-class architects will be in charge of guidance.					
<b>[Course objectives]</b>					
Prepare for an internship with the goal of developing practical skills related to building design and integrating practical knowledge. Comprehensively develop various abilities (drawing ability, presentation ability, communication ability, etc.) to realize the concept by utilizing various knowledge and knowledge while cultivating thinking ability at the important concept stage in the architectural production process.					
<b>[Course schedule and contents]</b>					
Arrangement of given conditions (once) Organize given conditions by organizing design conditions and contents, investigating the site environment, and grasping related laws and regulations.					
Analysis of similar cases (once) Verify and analyze cases similar to the task and organize the necessary knowledge.					
Basic plan (twice) Based on the grasped conditions and the knowledge obtained from similar examples, the design outline (including scale, number of floors, required rooms, zoning, structural plan, equipment plan, etc.) for basic design will be summarized.					
Basic design (twice) Based on the basic plan, a basic design plan will be created based on specific discussions with structural designers, equipment designers, acoustic designers, landscape designers, and other specialists.					
Presentation (twice) Create basic design documents (including design plans, structural plans, equipment plans, etc.), models, CG, animation, etc., and assist the presentation to the owner using these.					
Implementation design (3 times) Create design documents (including special specifications, plan outlines, finishing tables, design design drawings, exterior composition, structural design drawings, equipment design drawings, etc.) for estimation and construction.					
Continue to 建築設計実習(2)					



## 建築設計実習(2)

Accumulation and assessment (1 time)

Assess whether the accumulated contents by the builder are appropriate.

Various license application procedures (once)

In accordance with various laws and regulations such as the Building Standards Act, we will prepare the documents necessary for confirmation application, etc., and assist in prior consultation and various procedures.

Architectural supervision (1 time)

Assist the work of supervising on-site whether the construction is properly carried out according to the implementation design document.

Confirmation of learning achievement (once)

Confirm the learning achievement through the exhibition.

### [Course requirements]

None

### [Evaluation methods and policy]

Evaluate according to the implementation status of design training.

### [Textbooks]

Distribute materials as necessary and introduce the literature.

### [References, etc.]

#### ( Reference books )

Distribute materials as necessary and introduce the literature.

### [Study outside of class (preparation and review)]

Instruct as appropriate

### ( Other information (office hours, etc.) )

It is a practical requirement subject for architect examination qualification.

Check KULASIS for more information on office hours.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 7B077 SJ74				
<b>Course title (and course title in English)</b>	建築設計演習 Architecture Design Studio I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TAJI TAKAHIRO	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.4,5,Fri.1,2	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,2times, ,8times, ,2times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG04 7B079 SJ74				
<b>Course title (and course title in English)</b>	建築設計演習 Architecture Design Studio II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,DANIELL , Thomas Charles Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.4,5,Fri.3,5	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>This is a design exercise in which students work on three small assignments given by three guest architects under the guidance of teachers who are involved in architectural design practice. Based on the basic knowledge of architectural design acquired through undergraduate education, students learn more advanced academic and theoretical methods of architectural design through practical involvement in specific projects. You will be taught how to compile architectural plans into practical design drawings, how to relate these to structural design drawings and M&amp;E design drawings, and how to produce detailed design drawings. In particular, students will be taught how to communicate and present their work in English, as the subject matter of the course will be international in scope.</p>					
<b>[Course objectives]</b>					
<p>The aim of this course is to develop practical skills in architectural design and to synthesise practical knowledge. Organise and systematise the experience gained through the internship and aim to acquire more advanced architectural design methods. To develop the ability to express a message to society through architecture in a practical way.</p>					
<b>[Course schedule and contents]</b>					
<p>#1 Lecture and Briefing by guest architect A          #2 Desk Crits and Discussion          #3 Desk Crits and Discussion          #4 Final Review by Guest Architect A          #5 Feedback</p> <p>#6 Lecture and Briefing by guest architect B          #7 Desk Crits and Discussion          #8 Desk Crits and Discussion          #9 Final Review by Guest Architect B          #10 Feedback</p> <p>#11 Lecture and Briefing by guest architect C          #12 Desk Crits and Discussion          #13 Desk Crits and Discussion          #14 Final Review by Guest Architect C          #15 Feedback</p> <p>In 2021, the following three guest architects will be invited.</p>					
<div style="text-align: right;">Continue to 建築設計演習 (2)</div>					

## 建築設計演習 (2)

A Fuminori Nosaku (Fuminori Nosaku Architects)

B Norihisa Kawashima (Nori Architects)

C Masaaki Iwamoto (ICADA)

A detailed schedule will be given during the first lecture on 1 October at 4.30pm JST @Zoom.

#1 Guidance, Lecture and Briefing by Fuminori Nosaku

If you wish to attend, please register via Google Form.

<https://forms.gle/tofY8DrNdDoBiAcL7>

### [Course requirements]

None

### [Evaluation methods and policy]

Evaluation: Students will be assessed on the basis of their practical solution to the briefs and the final product.

### [Textbooks]

Instructed during class

### [References, etc.]

( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Introduced during class

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 7B080 PJ74				
<b>Course title (and course title in English)</b>	建築工事監理実習 Construction Supervision Practice		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KANETA TAKASHI Graduate School of Engineering Associate Professor, NISHINOSAYAKA Part-time Lecturer, MIZUKAWA TAKAHIKO	
<b>Target year</b>	1st year students or above	<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.3,4	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Engineering and practice of architects and supervisors required by architects law and building law.					
<b>[Course objectives]</b>					
To acquire the knowledge and the ability for architects and supervisors jobs.					
<b>[Course schedule and contents]</b>					
1-3. Laws and regulations. Building code, acts of architects and building engineers, construction business act, standard forms of design and supervision contract, standard forms of construction contract. 4-5. Overview of supervisions. Definition of terms concerning supervision. Role of supervision in project process. 6-10. Jobs in projects. Jobs of supervision in real projects. 11-15. Risk and troubles. Examples of troubles and their solutions.					
<b>[Course requirements]</b>					
Construction Engineering and Management I and II (undergraduate program) should be mastered.					
<b>[Evaluation methods and policy]</b>					
Report. Attendance of lectures and site visit are also evaluated. Absolute evaluation (raw score) Attendance and individual reports will be assessed on the basis of achievement level for course goals. - Those who are absent more than four times will not be credited. - Students will submit all reports. The reports with originality will be given a high score.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
Introduced during class					
----- Continue to 建築工事監理実習 (2) -----					

## 建築工事監理実習 (2)

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### [Study outside of class (preparation and review)]

Read the material introduced in the class.

### ( Other information (office hours, etc.) )

Contact to:

kaneta@archi.kyoto-u.ac.jp

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 7B088 SJ74					
<b>Course title (and course title in English)</b>	建築学総合演習 Exercises in Architecture and Architectural Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOSAKI MAKOTO		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Students will be assigned individual research topics and will be instructed on related analysis, fieldwork, exercises, surveys or experiments. Issues such as literature surveys and research trend surveys in related fields, and seeks students' awareness of problem discovery, while preparing and submitting report materials summarizing research content and research progress with the intention of writing a master's thesis. Is imposed. Gives advice on the contents of the research and discusses with presenters, faculty members, and attendees.						
<b>[Course objectives]</b>						
To be able to discover and organize the problems and difficulties to be solved through analysis, fieldwork, experiments, etc., for the research theme set by them, and to plan what steps should be taken to solve them. In addition, appropriate presentations on the progress of the research should be made, and the skills obtained to use the results of the discussion in conducting the research should be acquired.						
<b>[Course schedule and contents]</b>						
Research guidance and practice (30 times) Research meetings and guidance for individual students with laboratory seminars more than 30 times in total.						
<b>[Course requirements]</b>						
In principle, two years of study are required.						
<b>[Evaluation methods and policy]</b>						
Comprehensively judge report materials, understanding of research contents, research management skills, and presentation skills.						
<b>[Textbooks]</b>						
To be instructed during the exercise.						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Introduced during class						
<b>[Study outside of class (preparation and review)]</b>						
To be instructed during the exercise.						
( <b>Other information (office hours, etc.)</b> )						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG04 5B100 LJ74				
<b>Course title (and course title in English)</b>	静肃环境工学 Silence amenity engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOTANI MAKOTO Graduate School of Engineering Professor, TAKANO YASUSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
All energy consuming systems emit acoustical sound, and give us various informations. However, sound may also give us unpleasant feelings, as noise. Thus, it is very important to control sound or noise from various system to achieve comfortable acoustic environment. Objective of this silence amenity engineering course is to understand basic theory and mechanism of sound radiation from vibration or air flow, which are necessary to improve our acoustical environment.					
<b>[Course objectives]</b>					
Objective of this silence amenity engineering course is to get basic understand of sound radiation theory and mechanism, which is necessary to control noise.					
<b>[Course schedule and contents]</b>					
1. Introduction (week 1), Objective and context of the course 2. Wave propagation theory (week 2-5) Basic equations of air-borne and structure-borne sound, vibration and fluid dynamic noise 3. Mechanism of sound generation and its control (week 6-9), Typical noise control methods based on sound generation and propagation theory. Importance of noise regulation and standards 4. Group discussion (week 10-14) Presentation and discussion based on academic paper on sound source identification and generation and propagation control of sound 5. Feedback (week 15)					
<b>[Course requirements]</b>					
Understanding of geometrical acoustics within the texts for Environmental Engineering of Architecture II, or equivalent is required.					
<b>[Evaluation methods and policy]</b>					
Overall grading will be given based on student presentation (30%), and report (70%).					
<div style="text-align: right;">Continue to 静肃环境工学(2)</div>					



## 静肃环境工学(2)

### [Textbooks]

Instructed during class

Printed materials may also be distributed.

### [References, etc.]

#### ( Reference books )

Z.Maekawa et al 『Environmental and Architectural Acoustics』 ( CRC Press ) ISBN:ISBN:978-0367865467

Frank Fahy et al 『Sound and Structural Vibration』 ( Academic Press ) ISBN:978-9380501246

### [Study outside of class (preparation and review)]

Find issues on sound amenity, read related papers and propose solutions.

### ( Other information (office hours, etc.) )

Prior appointment is required in advance for the face to face meeting.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B222 LJ74				
<b>Course title (and course title in English)</b>	環境制御工学特論 Environmental Control Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, HARADA KAZUNORI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Lecture will be given on the elements of environmental formation in normal and fire conditions. The prediction methods of air flow, radiation and air quality is given. Discussion will be made on how to apply them to building design.					
<b>[Course objectives]</b>					
The participants are to acquire basic concept of environmental control and to be ready for conducting research on heat and air quality studies.					
<b>[Course schedule and contents]</b>					
<p>Introduction (1 week) The history of numerical analysis in environmental control is presented.</p> <p>Numerical methods in heat conduction in solids (5 weeks) A numerical method for heat conduction equation is introduced. At the end of this term, practice will be made on calculation methods in order to understand the basic concepts.</p> <p>Numerical methods in fluid flow (5 weeks) Control volume method is lectured as a basic method of calculation of fluid flow. At the end of the term, practice on SIMPLE algorithm is carried out.</p> <p>Combined analysis and turbulence (3 weeks) The concept of combined analysis of heat and fluid flow is introduced. It is understood that the turbulence models are also implemented in similar ways.</p> <p>End-term examination and evaluation of achievements (1 week) Checking degree of understanding.</p>					
<b>[Course requirements]</b>					
Knowledge on Environmental Engineering in Architecture I [U-ENG24 24009 LJ74] and II [U-ENG24 24010 LJ74] is assumed.					
<div style="text-align: right;">Continue to 環境制御工学特論(2)</div>					

## 環境制御工学特論(2)

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### [Evaluation methods and policy]

Scores are evaluated by an end-term examination.

### [Textbooks]

Hand-out's will be provided.

### [References, etc.]

#### ( Reference books )

To be specified during the course.

### [Study outside of class (preparation and review)]

Guidance will be given during the course.

### ( Other information (office hours, etc.) )

Questions will be accepted at occasions via Email. No explicit office hours are designated. If participants need to have time for questions, and/or discussions, contact the teacher via E-mail with his/her name, students number and intended schedule for meeting.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B226 LJ74				
<b>Course title (and course title in English)</b>	建築地盤工学 Building Geoenvironment Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKEWAKI IZURU Graduate School of Engineering Associate Professor, KOHEI FUJITA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Wave propagation theories are explained first for 1D, 2D and 3D models. 1D multi-reflection problems of waves are also formulated and explained. Based on these theories, methods for construction of design earthquake ground motions are presented. Soil-structure interaction problems are stated finally for the purpose of developing more rational design methods for building structures.					
<b>[Course objectives]</b>					
Obtain the knowledge on wave propagation theories and 1D multi-reflection theory of waves. Furthermore obtain the knowledge on construction of design earthquake ground motions and soil-structure interaction.					
<b>[Course schedule and contents]</b>					
Introduction and in-situ (field) tests, 1 class, Introduction of course is conducted and in-situ (field) tests are explained.					
Construction of design earthquake ground motions, 1 class, Construction of design earthquake ground motions is discussed. Response spectrum, Fourier spectrum and power spectrum are also discussed from the viewpoint of construction of design earthquake ground motions.					
Soil-structure interaction, 2 classes, The problem of soil-structure interaction is explained and various models for this problem are introduced.					
Exercise on structural design considering soil-structure interaction, 1 class, Exercise on structural design considering soil-structure interaction is conducted.					
Seismic damage to soil, pile and foundation, 1 class, Seismic damage to soil, pile and foundation is explained.					
Seismic upgrading (structures), 1 class, Seismic upgrading (structures) is discussed.					
Seismic upgrading (soil, pile and foundation), 1 class, Seismic upgrading (soil, pile and foundation) is discussed.					
Wave propagation (No.1), 1 class, 1D wave propagation problems are formulated and explained from its fundamentals.					
Wave propagation (No.2), 1 class,					
Continue to 建築地盤工学(2)					

## 建築地盤工学(2)

1D multi-reflection problems of waves are formulated and explained. The introduction of the program of SHAKE is also made.

Wave propagation (No.3), 1 class,  
3D wave propagation problems are formulated and explained.

Wave propagation (No.4), 1 class,  
2D wave propagation problems are formulated and explained as the simplification of 3D problems.

Wave propagation (No.5), 1 class,  
Surface waves (Rayleigh and Love waves) are explained from its fundamentals.

Exercise on wave propagation, 1 class,  
Exercise of wave propagation is conducted. 1D, 2D wave propagations are treated.

Confirmation of the Learning Degree, 1 class,

### [Course requirements]

Basics of mechanics. Fundamentals of vibration and wave propagation. Preliminary of linear algebra and calculus.

### [Evaluation methods and policy]

Evaluated by the term examination at the end of the semester.

### [Textbooks]

Not used

### [References, etc.]

( Reference books )  
Suggest in the class.

### [Study outside of class (preparation and review)]

Solve the exercises presented in the first class in parallel to the class advancement.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B231 LJ74				
<b>Course title (and course title in English)</b>	高性能構造工学 High Performance Structural Systems Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KOETAKA YUUII	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course discusses ultimate behavior of structural members and seismic devices used in steel structures, fundamental theories and engineering methodologies to achieve mechanical properties which they should possess; and explains basic and applied theories of seismic design of steel frame structures.					
<b>[Course objectives]</b>					
To understand the ultimate behaviors and mechanical properties of steel members, and learn the precautions in design and the concept of design equations. To understand the differences between plastic design and plastic analysis, and learn basic and applied seismic design that does not rely too much on computer numerical calculations.					
<b>[Course schedule and contents]</b>					
<p>Elasto-plastic behavior and design of steel frame structures</p> <p>The 1st class: Elasto-plastic behavior of steel members</p> <p>The 2nd class: Plastic analysis of one-story frames</p> <p>The 3rd class: Plastic collapse load of multi-story frames</p> <p>The 4th class: Plastic design of multi-story frames</p> <p>The 5th class: Plastic collapse load of beam-hinging type 3D frames with eccentricity</p> <p>The 6th class: Plastic design of steel frames with buckling-restrained braces</p> <p>The 7th class: Plastic design of steel frames with ordinary braces</p> <p>Ultimate behavior and design of steel members</p> <p>The 8th class: Flexural buckling of compression members</p> <p>The 9th class: Inelastic flexural buckling and behavior after flexural buckling</p> <p>The 10th class: Buckling restraint and design of buckling-restrained brace</p> <p>The 11th class: Lateral-torsional buckling</p> <p>The 12th class: Ultimate behavior of flexural members</p> <p>The 13th class: Ultimate behavior of members under bending moments and axial force</p> <p>The 14th class: Local buckling of steel plates</p> <p>Feedback of course</p> <p>The 15th class: Summaries and conclusions</p>					
<b>[Course requirements]</b>					
Would be preferable to have completed Mechanics of Building Structures, Steel Construction and Earthquake Resistant Structures.					
Continue to 高性能構造工学(2)					

## 高性能構造工学(2)

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### [Evaluation methods and policy]

Evaluation will be based on the scores of four times of reports (25 points per a report).

### [Textbooks]

Kazuo INOUE / Keiichiro SUITA 『建築鋼構造 - その理論と設計 - 』 ( Kajima Institute Publishing )  
ISBN:978-4306033443

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

To instruct as appropriate.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG04 5B234 LJ74			
<b>Course title (and course title in English)</b>	鋼構造特論 Steel Structures, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KOETAKA YUUII Graduate School of Engineering Assistant Professor, TAKATSUKA KOHEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Steel building structures are built up by connecting various members and parts at fabrication factory or construction site. This course discusses types of destruction of each connection using high-strength bolts or welds based on past disaster, and explains connection design and construction condition for achieving high ductile performance in accordance with basic and applied theories of limit state design.					
<b>[Course objectives]</b>					
To understand mechanical properties of steel material and mechanical behaviors of connections using welds or high-strength bolts, and learn design method of beam-to-column connections, brace connections and column base connections. To learn plastic analysis based on yield line theory, and further understand fatigue fracture and design methodology to prevent it.					
<b>[Course schedule and contents]</b>					
The 1st-2nd class: Design methodology of connections					
The 3rd class: Design of brace connections					
The 4th-6th class: Plastic analysis of flat plate under out-of-plane load					
The 7th-10th class: Design of beam-to-column connections					
The 11th-12th class: Design of column base connections					
The 13th-14th class: Fatigue fracture and design against fatigue					
The 15th class: Feedback of course					
<b>[Course requirements]</b>					
Would be preferable to have completed Mechanics of Building Structures and Steel Construction.					
<b>[Evaluation methods and policy]</b>					
Evaluation will be based on the scores of five times of reports (20 points per a report).					
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Continue to 鋼構造特論(2)					



## 鋼構造特論(2)

### [Textbooks]

Kazuo INOUE / Keiichiro SUITA 『建築鋼構造 - その理論と設計 - 』 ( Kajima Institute Publishing )  
ISBN:978-4306033443

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

To instruct as appropriate.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG04 5B238 LJ74			
<b>Course title (and course title in English)</b>	建築風工学 Architectural Wind Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor, MARUYAMA TAKASHI Disaster Prevention Research Institute Associate Professor, NISHIJIMA KAZUYOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course will explain wind characteristics which is essential to wind resistant design of architecture and evaluation of wind environment including the mechanism of wind genesis and the effect of weather condition, topography and surface roughness. The characteristics of strong wind of typhoon or tornado causing damage to buildings is discussed. We will provide an overview of strong wind damage and explain the method of damage mitigation and disaster prevention. We will discuss the flow around building, the wind pressure and force on building, and the vibration of building caused by wind. We will provide a short history of wind resistant design and some exercises of calculating wind load on building.					
<b>[Course objectives]</b>					
Acquisition of knowledge on prediction and evaluation for wind load and wind environment around new construction planned building.					
<b>[Course schedule and contents]</b>					
<p>Mechanism of wind genesis and wind characteristics, 3 classes: This course will explain the mean and instantaneous wind speed, i.e. the characteristics of wind in atmospheric boundary layer, which is essential to wind resistant design of architecture. We will discuss the cause of wind genesis by examining the forcing mechanism and the balancing wind speed and direction.</p> <p>Strong wind disaster in Japan and its characteristics, 2 classes: This course will explain the strong wind characteristics of typhoon and tornado causing damage to buildings and houses by comparing other natural disasters. We will have an overview of historical strong wind damage in Japan and explain the features.</p> <p>Wind flow around object, 2 classes: We will discuss the foundation of fluid dynamics describing the flow around a body which is essential for the evaluation of wind load on buildings and demonstrate the wind flows around buildings and houses.</p> <p>Method of wind environment prediction - 1, 1 class: This class will drive the similarity law for wind tunnel test using scale models which is one of useful tools for wind load evaluation. We will also explain the wind tunnel test.</p> <p>Method of wind environment prediction - 2, 2 classes: These classes will explain the foundation of fluid dynamics and provide the examples of calculation.</p> <p>History of wind resistant design and wind load evaluation, 2 classes: These courses will provide an overview of the history of wind load evaluation in the Recommendations for</p>					
----- Continue to 建築風工学(2) -----					

## 建築風工学(2)

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Loads on Highrisebuildings.

Procedure of wind load evaluation based on the Building Standards Act and AIJ Recommendations for Loads on Buildings, 2 classes:

These courses will provide the evaluation method of design wind load on real buildings based on the Building Standards Act, Building Standard Law Enforcement Order and AIJ Recommendations for Loads on Buildings and practical training of calculation. We will explain the cautionary note on strong wind cause by tornado such as the wind glass breakage which is not include the law.

Confirmation of learning attainment, 1 class:

This class will summarize the course and confirm learning attainment.

### [Course requirements]

Architectural structural engineering, fluid dynamics and meteorology will be desirable but not be obligated.

### [Evaluation methods and policy]

By reports or examination

### [Textbooks]

Instructed during class

Non, References, documents will be distributed

### [References, etc.]

( Reference books )

Introduced during class

Non

### [Study outside of class (preparation and review)]

To be indicated during the lecture.

### ( Other information (office hours, etc.) )

Questions : directing during class

Please visit KULASIS to find out about office hours.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG04 5B241 LJ74			
<b>Course title (and course title in English)</b>	都市災害管理学 Urban Disaster Management		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor,MATSUSHIMA SHINICHI Disaster Prevention Research Institute Professor,Yuki Sakai Disaster Prevention Research Institute Associate Professor,NISHINO TOMOAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In recent years, as the urban society becomes more dense and high-functioning, the factor of disasters become more complex and the risk of disasters have risen. Therefore, the necessity of the integrated disaster mitigation measures before the disaster, immediately after the disaster, and long after the disaster is pointed out. In this lecture, the actual damage by past earthquakes and its generation process, methods to predict strong motions and methods to predict building damages based on predicted ground motions, technique to evaluate earthquake-resistant performance actual buildings, risk evaluation methods of fire by earthquakes and tsunami in urban area and its damage estimation method, is explained.					
<b>[Course objectives]</b>					
Understand the seismic risk evaluation, fire risk evaluation and evaluation of impact of disasters for structures and urban systems, and the disaster prevention countermeasures and learn about prediction methods for disaster management and the basics to think by oneself about its policy.					
<b>[Course schedule and contents]</b>					
Mechanism of disasters by earthquakes, 2 times, What is urban disaster management? Mechanism of disasters by earthquakes, source mechanisms for disastrous earthquakes in and around Japan, ground motion generation process, seismic intensity and magnitude, characteristics of observed ground motion will be explained from previous earthquake disasters. Basics of wave propagation and strong ground motion, 3 times, Wave propagation analysis and strong motion simulation Structural response estimation, 5 times, Modeling of structures and prediction of their responses Mechanism of post-earthquake fires and disaster estimation, 2 times, Earthquake risk analysis considering of the post-earthquake fires Mechanism of Tsunami and Tsunami fire and disaster estimation, 2 times, Evaluation of hazard by Tsunami fires Student Assessment, 1 time, Assessment of the how much students have achieved the learning objectives.					
<b>[Course requirements]</b>					
Basic knowledge of anti-seismic engineering and environmental engineering					
<b>[Evaluation methods and policy]</b>					
[Evaluation method] Grading will be based on final report (60%) and daily attendance (40%). Attendance to classes and reports in classes are included in the daily attendance. [Evaluation policy]					
Continue to 都市災害管理学(2)					

## 都市災害管理学(2)

The attainment target will be evaluated according to the policy of grading of the Graduate School of Engineering.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Earthquake Ground Motion and Strong Motion Prediction - Key items for learning the basics - (AIJ)

Ground motion - phenomena and theory (AIJ)

Vibration of Architecture (Asakura Publishing)

Urban disaster prevention: Theory and practice of earthquake countermeasures (Gakugei Shuppan)

Building fire prevention (Asakura Publishing)

Introduction to building fire safety engineering (The Building Center of Japan)

### [Study outside of class (preparation and review)]

Instructed if necessary

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5B259 LJ74				
<b>Course title (and course title in English)</b>	音響空間設計論 Theory of Acoustic Space Design in Architecture		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, OOTANI MAKOTO Graduate School of Engineering Professor, TAKANO YASUSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>For the realization of optimal acoustic space design in architecture, it is essential to understand</p> <ul style="list-style-type: none"> <li>- Prediction of physical parameters of sound field in architecture</li> <li>- Measurement and analysis of sound field</li> <li>- Perception and cognition of acoustic space</li> </ul> <p>with in-depth understanding of acoustics, psychology of hearing, and acoustic signal processing. This lecture introduces these theories and methods from physical and psychological viewpoints and recent research trend. In addition, presentation and discussion by students are conducted for better understandings.</p>					
<b>[Course objectives]</b>					
<p>In-depth understandings of</p> <ul style="list-style-type: none"> <li>- Prediction of acoustic space - Measurement and analysis of acoustic space</li> <li>- Theory and method of perceptual evaluation for optimal acoustic space design in architecture.</li> </ul>					
<b>[Course schedule and contents]</b>					
<p>Introduction, 1 time, Overview</p> <p>Acoustics, 1 time, Acoustics for understanding behavior of sound field and sound wave</p> <p>Acoustic signal processing, 1 time, Acoustic signal processing for measurement, analysis, and control of sound field</p> <p>Auditory perception, 2 times, Mechanism of spatial and temporal perception of sound field, based on psychology of hearing. Multi-modal perception between hearing and other modalities.</p> <p>Physical parameters of sound field and its prediction, 2 times, Physical parameters for measuring sound field quality. Theories and methods for predicting physical parameters by computational simulations.</p> <p>Measurement and analysis of sound field, 2 times, Basic measurement and analysis method of physical information in sound field. Measurement and analysis of spatial information of sound field.</p> <p>Auralization of sound field, 2 times, Auralization of acoustic space in architecture in its design stage. Theories and methods of acoustic space.</p> <p>Presentation, 4 times, Participants#039 presentation and discussion on research survey in the field of acoustic environment.</p>					
<b>[Course requirements]</b>					
None					
<p style="text-align: right;">Continue to 音響空間設計論(2)</p>					

## 音響空間設計論(2)

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### [Evaluation methods and policy]

Presentation (50%) and report (50%)

### [Textbooks]

Provided from the lecturer during the class.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

To be instructed during the class.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG04 5i017 LE74			
<b>Course title (and course title in English)</b>	建築学コミュニケーション (専門英語) Architecture Communication		<b>Instructor's name, job title, and department of affiliation</b>	Part-time Lecturer,TSOI, Esther Graduate School of Engineering Professor,DANIELL , Thomas Charles	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>English is the global working language of arts and science, as well as in international project collaborations. Japanese architectural design sensibilities are well sought after overseas. On the other hand, prominent clients likes to employ international talents to provide a view outside the box. Being able to lead a discussion in English with people from all backgrounds, as well as honing and communicating one ' s unique sensibilities, would be an important skill to survive in a global changing environment.</p> <p>In this class we will go through the different studies of architecture in English, writing and presenting short essays on our way. The final project will be a group proposal and presentation on “ a Memorial ” .</p>					
<b>[Course objectives]</b>					
<p>Able to use fluent English for communicating and presenting architectural ideas.</p> <p>A1 Communication ability  A2 Understanding architecture from different perspectives  B2 Understanding architectural design and spatial planning  C2 Understanding how architecture affects society  C3 Acting with correct judgement based on historical and social understanding  D2 Having one ' s unique viewpoint  E2 Understanding global and local values</p>					
<b>[Course schedule and contents]</b>					
<p>Wk 1: A brief overview on famous Western architects and introduction to some previous projects that I had worked on. Review about Renzo Piano ' s workshop versus Gund Hall at GSD. An introduction to Carpenter Center, Le Corbusier ' s only architecture in America. (Self introduction.)  Introduction to first assignment on an essay about your favourite architecture.</p> <p>Wk 2*: Glass and Steel 1: review on historical development and modern details.  Submission and presentation about first essay.</p> <p>Wk 3: Glass and Steel 2: review on historical development and modern details.  Continue presentation about first essay.</p> <p>Wk 4: The Technology Effect/ Crystal Palace 1  Introduction to second assignment “ Architecture and Technology ” : list 3 architectural effects related to technology, and describe how materials and technology produced them.</p>					
<p>-----</p> <p style="text-align: right;">Continue to 建築学コミュニケーション (専門英語) (2)</p>					



## 建築学コミュニケーション (専門英語) (2)

Wk 5: The Technology Effect/ Crystal Palace 2, and shopping malls development.

Wk 6\*: Pompidou Center 1: technology and city

Submission and presentation of second essay “ Architecture and Technology ” .

Fill-in-the-blank test (open book).

Wk 7\*: Pompidou Center 2: technology and political movement. Comparison to Hong Kong Bank.

Continue presentation about second essay. Schematization test (concept check).

Wk 8: Utopia/ Ledoux 1: ideal and architectural representation

Wk 9\*: Utopia/ Ledoux 2. Revision on terms. Fill-in-the-blank test for Hong Kong Bank.

Wk 10: A review on Rem Koolhaas ' thoughts and works.

Wk 11: Cities in the world. Introduction to Kevin Lynch ' s “ The Image of the City ” .

Introduction to final group project: proposal and presentation of “ A Memorial ” in the city.

Wk 12: Critical Memory 1: Peter Eisenman ' s design in Berlin

Presentation about your group and topic.

Wk 13\*: Critical Memory 2

Presentation about your group ' s Memorial proposal.

Wk 14\*: Group presentation.

Wk 15: Feedback class. Follow-up

No final examination.

The schedule may be subject to change.

### [Course requirements]

None

### [Evaluation methods and policy]

Students will need to listen and read different texts, and solve the related problems. Students are expected to be able to write, discuss and present architecture in English at the end of the class. There will be no final examination. Attendance, class participation and exercise completion is important. No plagiarism. Students who have less than 60% in attendance will fail. Late arrival for more than 10 minutes or leaving early without satisfactory explanation will be considered non-attendance.

Homework - 40% Presentations - 40%. Attendance - 20%.

**[Textbooks]**

Please check URL below.

**[References, etc.]**

**( Reference books )**

Christian Norberg-Schulz, Genius Loci: Towards a Phenomenology of Architecture, Academy Editions Ltd, 1980.

[https://marywoodthesisresearch.files.wordpress.com/2014/03/genius-loci-towards-a-phenomenology-of-architecture-part1\\_.pdf](https://marywoodthesisresearch.files.wordpress.com/2014/03/genius-loci-towards-a-phenomenology-of-architecture-part1_.pdf)

Kenneth Frampton, Modern Architecture: A Critical History, Thames and Hudson, 1992.

[https://doubleoperative.files.wordpress.com/2009/12/kenneth-frampton\\_modern-architecture.pdf](https://doubleoperative.files.wordpress.com/2009/12/kenneth-frampton_modern-architecture.pdf)

Le Corbusier, Towards a New Architecture, Dover, 1986.

<https://cisematablog.files.wordpress.com/2016/11/towards-a-new-architecture1-1.pdf>

Christian Schittich, in Detail Japan, Birkhauser, 2002.

Graphic Anatomy Atelier Bow-Wow, Toto, 2007.

Francis D.K. Ching, Building Construction Illustrated, John Wiley and Sons, 1991.

Francis D.K. Ching, A Visual Dictionary of Architecture, John Wiley and Sons, 2011.

Steen Eiler Rasmussen, Experiencing Architecture, MIT Press, 1992.

[https://openlab.citytech.cuny.edu/12101291coordination/files/2011/06/Rasmussen\\_and\\_Elam\\_Proportions.pdf](https://openlab.citytech.cuny.edu/12101291coordination/files/2011/06/Rasmussen_and_Elam_Proportions.pdf)

Gunter Nitschke, From Shinto to Ando, Academy, 1993.

[http://www.east-asia-architecture.org/downloads/research/MA\\_-\\_The\\_Japanese\\_Sense\\_of\\_Place\\_-\\_Forum.pdf](http://www.east-asia-architecture.org/downloads/research/MA_-_The_Japanese_Sense_of_Place_-_Forum.pdf)

Junichiro Tanizaki, In Praise of Shadows, Leet ' s Island Books, 1997.

[http://www.edu.artcenter.edu/mertzel/spatial\\_scenography\\_1/Class%20Files/resources/In%20Praise%20of%20Shadows.pdf](http://www.edu.artcenter.edu/mertzel/spatial_scenography_1/Class%20Files/resources/In%20Praise%20of%20Shadows.pdf)

Kevin Lynch, The Image of the City, Harvard-MIT Joint Center for Urban Studies Series, 1964.

[http://www.miguelangelmartinez.net/IMG/pdf/1960\\_Kevin\\_Lynch\\_The\\_Image\\_of\\_The\\_City\\_book.pdf](http://www.miguelangelmartinez.net/IMG/pdf/1960_Kevin_Lynch_The_Image_of_The_City_book.pdf)

**( Related URLs )**

[http://www.edu.artcenter.edu/mertzel/spatial\\_scenography\\_1/Class%20Files/resources/In%20Praise%20of%20Shadows.pdf](http://www.edu.artcenter.edu/mertzel/spatial_scenography_1/Class%20Files/resources/In%20Praise%20of%20Shadows.pdf) (Tanizaki Junichiro, In Praise of Shadows.)

[https://1drv.ms/b/s!AhVq\\_riAFrGsgSdTZP5ykPintWMq](https://1drv.ms/b/s!AhVq_riAFrGsgSdTZP5ykPintWMq) (John Sallis, Stone.)

<http://miessociety.org/mies/speeches/id-merger/> (Mies van der Rohe, ID Merger speech.)

[https://1drv.ms/b/s!AhVq\\_riAFrGsgSl7\\_073rYqfkLCx](https://1drv.ms/b/s!AhVq_riAFrGsgSl7_073rYqfkLCx) (Construction History)

[https://1drv.ms/b/s!AhVq\\_riAFrGsgShPD7LwDaseZAb9](https://1drv.ms/b/s!AhVq_riAFrGsgShPD7LwDaseZAb9) (Space, Time & Architecture)

[https://1drv.ms/w/s!AhVq\\_riAFrGsgTy57oqLy253JJD1](https://1drv.ms/w/s!AhVq_riAFrGsgTy57oqLy253JJD1) (Beaubourg Effect)

[https://1drv.ms/b/s!AhVq\\_riAFrGsgSu28rkaBXp\\_f9cs](https://1drv.ms/b/s!AhVq_riAFrGsgSu28rkaBXp_f9cs) (The Theater of Industry)

## 建築学コミュニケーション ( 専門英語 ) (4)

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<https://cisematakblog.files.wordpress.com/2016/11/towards-a-new-architecture1-1.pdf>(Le Corbusier, Towards a New Architecture.)

[http://www.icomos-poland.org/pl/?option=com\\_dropfiles&format=&task=frontfile.download&catid=67&id=66&Itemid=10000000000000](http://www.icomos-poland.org/pl/?option=com_dropfiles&format=&task=frontfile.download&catid=67&id=66&Itemid=10000000000000)(Francis Ching, A Visual Dictionary of Architecture.)

<http://www.east-asia-architecture.org/aotm/index.html>(Hand or Machine, by Esther Tsoi, 2012.)

### [Study outside of class (preparation and review)]

Please read materials from the above URL. Research the meaning of words in advance and at your leisure.

### ( Other information (office hours, etc.) )

About Esther: <http://linkedin.com/in/kyokoto>

Esther can be reached by e-mail. Assignments will have to be handed in class.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG34 6Q005 SJ74				
<b>Course title (and course title in English)</b>	建築設計・計画学セミナーⅠ Seminar on Architectural Design and Planning I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KANETA TAKASHI Graduate School of Engineering Professor,KANKI KIYOKO Disaster Prevention Research Institute Professor,MAKI NORIO Graduate School of Engineering Professor,MIURA KEN Graduate School of Engineering Professor,DANIELL , Thomas Charles Graduate School of Engineering Professor,TAJI TAKAHIRO Graduate School of Engineering Professor,TOMISHIMA YOSHIAKI Graduate School of Engineering Professor,HIRATA AKIHISA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
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Continue to 建築設計・計画学セミナーⅠ(2)					

建築設計・計画学セミナーⅠ(2)

**[Textbooks]**

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q006 SJ74			
<b>Course title (and course title in English)</b>	建築設計・計画学セミナーII Seminar on Architectural Design and Planning II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KANETA TAKASHI Graduate School of Engineering Professor,KANKI KIYOKO Disaster Prevention Research Institute Professor,MAKI NORIO Graduate School of Engineering Professor,MIURA KEN Graduate School of Engineering Professor,DANIELL , Thomas Charles Graduate School of Engineering Professor,TAJI TAKAHIRO Graduate School of Engineering Professor,TOMISHIMA YOSHIAKI Graduate School of Engineering Professor,HIRATA AKIHISA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
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Continue to 建築設計・計画学セミナーII(2)					

建築設計・計画学セミナーⅡ(2)

**[Textbooks]**

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q008 SJ74			
<b>Course title (and course title in English)</b>	建築構造学セミナー I Seminar on Structural Engineering of Buildings I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,OOSAKI MAKOTO Graduate School of Engineering Professor,TAKEWAKI IZURU Graduate School of Engineering Professor,NISHIYAMA MINEHIRO Disaster Prevention Research Institute Professor,MARUYAMA TAKASHI Graduate School of Engineering Professor,HAYASHI YASUHIRO Graduate School of Engineering Professor,KANEKO YOSHIO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Research presentation related to building structure is made. Then, questions and answers by the faculty or the other students are performed. The advice about the research is given being conscious of writing a doctoral thesis.					
<b>[Course objectives]</b>					
Research contents are made to be substantial as a doctoral dissertation. The capability to present the research content to the researcher of an outside domain is learned. The ability to respond to questions or comments from various view points exactly is learned.					
<b>[Course schedule and contents]</b>					
A research presentation (15 times): Students make research presentation, and has a question-and-answer session.					
<b>[Course requirements]</b>					
Students should be belong to the laboratories specialize in structure. Students cannot study both of the Building Structure Seminar I and III in the same fiscal year.					
<b>[Evaluation methods and policy]</b>					
Evaluation is based on the presentation and the reports which describe the comment over other students' presentation.					
<b>[Textbooks]</b>					
Not used					
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Continue to 建築構造学セミナー I (2)					



建築構造学セミナー I (2)

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

None

**( Other information (office hours, etc.) )**

None

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG33 6Q009 SJ74			
<b>Course title (and course title in English)</b>	建築構造学セミナーII Seminar on Structural Engineering of Buildings II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKEWAKI IZURU Graduate School of Engineering Professor, OOSAKI MAKOTO Graduate School of Engineering Professor, NISHIYAMA MINEHIRO Disaster Prevention Research Institute Professor, MARUYAMA TAKASHI Graduate School of Engineering Professor, HAYASHI YASUHIRO Graduate School of Engineering Professor, KANEKO YOSHIO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Research presentation related to building structure is made. Then, questions and answers by the faculty or the other students are performed. The advice about the research is given being conscious of writing a doctoral thesis.					
<b>[Course objectives]</b>					
Research contents are made to be substantial as a doctoral dissertation. The capability to present the research content to the researcher of an outside domain is learned. The ability to respond to questions or comments from various view points exactly is learned.					
<b>[Course schedule and contents]</b>					
A research presentation (15 times): Students make research presentation, and has a question-and-answer session.					
<b>[Course requirements]</b>					
[履修要件] Students should be belong to the laboratories specialize in structure. Students cannot study both of the Building Structure Seminar II and IV in the same fiscal year.					
<b>[Evaluation methods and policy]</b>					
Evaluation is based on the presentation and the reports which describe the comment over other students' presentation.					
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Continue to 建築構造学セミナーII(2)					

## 建築構造学セミナーⅡ(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

None

### [Study outside of class (preparation and review)]

Npne

### ( Other information (office hours, etc.) )

None

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q011 SJ74			
<b>Course title (and course title in English)</b>	建築環境工学セミナー I Seminar on Environmental Engineering I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OGURA DAISUKE Graduate School of Engineering Professor, HARADA KAZUNORI Graduate School of Engineering Professor, TAKANO YASUSHI Graduate School of Engineering Professor, ISHIDA TAIICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Seminar topics are selected among heat transfer, human comfort on thermal, lighting, sound sensation, building systems such as HVAC, water supply, sanitation and electricity. Through discussions, the participants are encouraged to understand deeply the subject and to develop ability to think themselves. To increase the progress of doctoral study, presentation and report are obligatory in order to receive instructions by professors and to join discussion among participants.					
<b>[Course objectives]</b>					
The course intends to summarize the development of his/her own research, to develop skills to convey his/her ideas to the researchers in other areas and to join discussions in multiple viewpoints properly.					
<b>[Course schedule and contents]</b>					
Research presentations and discussion, 15 times. Participants shall make presentations on the research of his/her own and make discussions among other participants and instructors.					
<b>[Course requirements]</b>					
As a general rule, students belonging to laboratories on the architectural environmental engineering are permitted to attend.					
<b>[Evaluation methods and policy]</b>					
Presentation of research contents of his/her own and discussions among other participants and professors are necessary. The degree of understanding, the ability of conducting research by his/her own intention, the skills of presentation will be evaluated. In addition, the interest to broader range of research area, the ability of finding and solving problems are judged.					
<b>[Textbooks]</b>					
To be specified during the course.					
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Continue to 建築環境工学セミナー I (2)					

## 建築環境工学セミナー I (2)

### [References, etc.]

#### ( Reference books )

Supplemental textbooks will be specified during the course if necessary.

### [Study outside of class (preparation and review)]

To be specified during the course.

### ( Other information (office hours, etc.) )

This seminar shall not be registered in parallel with Seminar on Environmental Engineering III.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q012 SJ74				
<b>Course title (and course title in English)</b>	建築環境工学セミナーⅡ Seminar on Environmental Engineering II			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OGURA DAISUKE Graduate School of Engineering Professor, HARADA KAZUNORI Graduate School of Engineering Professor, TAKANO YASUSHI Graduate School of Engineering Professor, ISHIDA TAIICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Seminar topics are selected among heat transfer, human comfort on thermal, lighting, sound sensation, building systems such as HVAC, water supply, sanitation and electricity. Through discussions, the participants are encouraged to understand deeply the subject and to develop ability to think themselves. To increase the progress of doctoral study, presentation and report are obligatory in order to receive instructions by professors and to join discussion among participants.						
<b>[Course objectives]</b>						
The course intends to summarize the development of his/her own research, to develop skills to convey his/her ideas to the researchers in other areas and to join discussions in multiple viewpoints properly.						
<b>[Course schedule and contents]</b>						
Research presentations and discussion, 15 times. Participants shall make presentations on the research of his/her own and make discussions among other participants and instructors.						
<b>[Course requirements]</b>						
As a general rule, students belonging to laboratories on the architectural environmental engineering are permitted to attend.						
<b>[Evaluation methods and policy]</b>						
Presentation of research contents of his/her own and discussions among other participants and professors are necessary. The degree of understanding, the ability of conducting research by his/her own intention, the skills of presentation will be evaluated. In addition, the interest to broader range of research area, the ability of finding and solving problems are judged.						
<b>[Textbooks]</b>						
To be specified during the course.						
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Continue to 建築環境工学セミナーⅡ(2)						

## 建築環境工学セミナーⅡ(2)

### [References, etc.]

#### ( Reference books )

Supplemental textbooks will be specified during the course if necessary.

### [Study outside of class (preparation and review)]

To be specified during the course.

### ( Other information (office hours, etc.) )

This seminar shall not be registered in parallel with Seminar on Environmental Engineering IV.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q013 SJ74			
<b>Course title (and course title in English)</b>	建築環境工学セミナーⅢ Seminar on Environmental Engineering III		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OGURA DAISUKE Graduate School of Engineering Professor, HARADA KAZUNORI Graduate School of Engineering Professor, TAKANO YASUSHI Graduate School of Engineering Professor, ISHIDA TAIICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Seminar topics are selected among heat transfer, human comfort on thermal, lighting, sound sensation, building systems such as HVAC, water supply, sanitation and electricity. Through discussions, the participants are encouraged to understand deeply the subject and to develop ability to think themselves. To increase the progress of doctoral study, presentation and report are obligatory in order to receive instructions by professors and to join discussion among participants.					
<b>[Course objectives]</b>					
The course intends to summarize the development of his/her own research, to develop skills to convey his/her ideas to the researchers in other areas and to join discussions in multiple viewpoints properly.					
<b>[Course schedule and contents]</b>					
Research presentations and discussion, 15 times. Participants shall make presentations on the research of his/her own and make discussions among other participants and instructors.					
<b>[Course requirements]</b>					
As a general rule, students belonging to laboratories on the architectural environmental engineering are permitted to attend.					
<b>[Evaluation methods and policy]</b>					
Presentation of research contents of his/her own and discussions among other participants and professors are necessary. The degree of understanding, the ability of conducting research by his/her own intention, the skills of presentation will be evaluated. In addition, the interest to broader range of research area, the ability of finding and solving problems are judged.					
<b>[Textbooks]</b>					
To be specified during the course.					
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Continue to 建築環境工学セミナーⅢ(2)					



## 建築環境工学セミナーⅢ(2)

### [References, etc.]

#### ( Reference books )

Supplemental textbooks will be specified during the course if necessary.

### [Study outside of class (preparation and review)]

To be specified during the course.

### ( Other information (office hours, etc.) )

This seminar shall not be registered in parallel with Seminar on Environmental Engineering I.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q014 SJ74				
<b>Course title (and course title in English)</b>	建築環境工学セミナーⅣ Seminar on Environmental Engineering IV			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OGURA DAISUKE Graduate School of Engineering Professor, HARADA KAZUNORI Graduate School of Engineering Professor, TAKANO YASUSHI Graduate School of Engineering Professor, ISHIDA TAIICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Seminar topics are selected among heat transfer, human comfort on thermal, lighting, sound sensation, building systems such as HVAC, water supply, sanitation and electricity. Through discussions, the participants are encouraged to understand deeply the subject and to develop ability to think themselves. To increase the progress of doctoral study, presentation and report are obligatory in order to receive instructions by professors and to join discussion among participants.						
<b>[Course objectives]</b>						
The course intends to summarize the development of his/her own research, to develop skills to convey his/her ideas to the researchers in other areas and to join discussions in multiple viewpoints properly.						
<b>[Course schedule and contents]</b>						
Research presentations and discussion, 15 times. Participants shall make presentations on the research of his/her own and make discussions among other participants and instructors.						
<b>[Course requirements]</b>						
As a general rule, students belonging to laboratories on the architectural environmental engineering are permitted to attend.						
<b>[Evaluation methods and policy]</b>						
Presentation of research contents of his/her own and discussions among other participants and professors are necessary. The degree of understanding, the ability of conducting research by his/her own intention, the skills of presentation will be evaluated. In addition, the interest to broader range of research area, the ability of finding and solving problems are judged.						
<b>[Textbooks]</b>						
To be specified during the course.						
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Continue to 建築環境工学セミナーⅣ(2)						

## 建築環境工学セミナーⅣ(2)

### [References, etc.]

#### ( Reference books )

Supplemental textbooks will be specified during the course if necessary.

### [Study outside of class (preparation and review)]

To be specified during the course.

### ( Other information (office hours, etc.) )

This seminar shall not be registered in parallel with Seminar on Environmental Engineering II.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q015 SJ74			
<b>Course title (and course title in English)</b>	建築構造学セミナーIII Seminar on Structural Engineering of Buildings III		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKEWAKI IZURU Graduate School of Engineering Professor, OOSAKI MAKOTO Graduate School of Engineering Professor, NISHIYAMA MINEHIRO Disaster Prevention Research Institute Professor, MARUYAMA TAKASHI Graduate School of Engineering Professor, HAYASHI YASUHIRO Graduate School of Engineering Professor, KANEKO YOSHIO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Research presentation related to building structure is made. Then, questions and answers by the faculty or the other students are performed. The advice about the research is given being conscious of writing a doctoral thesis.					
<b>[Course objectives]</b>					
Research contents are made to be substantial as a doctoral dissertation. The capability to present the research content to the researcher of an outside domain is learned. The ability to respond to questions or comments from various view points exactly is learned.					
<b>[Course schedule and contents]</b>					
A research presentation (15 times): Students make research presentation, and has a question-and-answer session.					
<b>[Course requirements]</b>					
Students should belong to the laboratories specialize in structure. Students cannot study both of the Building Structure Seminar I and III in the same fiscal year.					
<b>[Evaluation methods and policy]</b>					
Evaluation is based on the presentation and the reports which describe the comment over other students' presentation.					
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Continue to 建築構造学セミナーIII(2)					

建築構造学セミナーⅢ(2)

**[Textbooks]**

Not used

**[References, etc.]**

( Reference books )

None

**[Study outside of class (preparation and review)]**

None

**( Other information (office hours, etc.) )**

None

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q016 SJ74			
<b>Course title (and course title in English)</b>	建築構造学セミナーⅣ Seminar on Structural Engineering of Buildings IV		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKEWAKI IZURU Graduate School of Engineering Professor, OOSAKI MAKOTO Graduate School of Engineering Professor, NISHIYAMA MINEHIRO Disaster Prevention Research Institute Professor, MARUYAMA TAKASHI Graduate School of Engineering Professor, HAYASHI YASUHIRO Graduate School of Engineering Professor, KANEKO YOSHIO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Research presentation related to building structure is made. Then, questions and answers by the faculty or the other students are performed. The advice about the research is given being conscious of writing a doctoral thesis.					
<b>[Course objectives]</b>					
Research contents are made to be substantial as a doctoral dissertation. The capability to present the research content to the researcher of an outside domain is learned. The ability to respond to questions or comments from various view points exactly is learned.					
<b>[Course schedule and contents]</b>					
A research presentation (15 times): Students make research presentation, and has a question-and-answer session.					
<b>[Course requirements]</b>					
Students should be belong to the laboratories specialize in structure. Students cannot study both of the Building Structure Seminar II and IV in the same fiscal year.					
<b>[Evaluation methods and policy]</b>					
Evaluation is based on the presentation and the reports which describe the comment over other students' presentation.					
<b>[Textbooks]</b>					
Not used					
----- Continue to 建築構造学セミナーⅣ(2) -----					

建築構造学セミナーⅣ(2)

**[References, etc.]**

( Reference books )

None

**[Study outside of class (preparation and review)]**

None

**( Other information (office hours, etc.) )**

None

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q017 SJ74			
<b>Course title (and course title in English)</b>	建築設計・計画学セミナーIII Seminar on Architectural Design and Planning III		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KANETA TAKASHI Graduate School of Engineering Professor,KANKI KIYOKO Disaster Prevention Research Institute Professor,MAKI NORIO Graduate School of Engineering Professor,MIURA KEN Graduate School of Engineering Professor,DANIELL , Thomas Charles Graduate School of Engineering Professor,TAJI TAKAHIRO Graduate School of Engineering Professor,TOMISHIMA YOSHIAKI Graduate School of Engineering Professor,HIRATA AKIHISA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
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Continue to 建築設計・計画学セミナーIII(2)					



建築設計・計画学セミナーⅢ(2)

**[Textbooks]**

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 6Q018 SJ74			
<b>Course title (and course title in English)</b>	建築設計・計画学セミナーⅣ Seminar on Architectural Design and Planning IV		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KANETA TAKASHI Graduate School of Engineering Professor,KANKI KIYOKO Disaster Prevention Research Institute Professor,MAKI NORIO Graduate School of Engineering Professor,MIURA KEN Graduate School of Engineering Professor,DANIELL , Thomas Charles Graduate School of Engineering Professor,TAJI TAKAHIRO Graduate School of Engineering Professor,TOMISHIMA YOSHIAKI Graduate School of Engineering Professor,HIRATA AKIHISA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
-----					
Continue to 建築設計・計画学セミナーⅣ(2)					

建築設計・計画学セミナーⅣ(2)

**[Textbooks]**

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 5Q021 LJ74			
<b>Course title (and course title in English)</b>	先端建築学特論Ⅰ Advanced Theory of Architecture and Architectural Engineering I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TAKANO YASUSHI	
				Graduate School of Engineering Professor,HARADA KAZUNORI	
				Graduate School of Engineering Professor,KANETA TAKASHI	
				Graduate School of Engineering Professor,KANKI KIYOKO	
				Disaster Prevention Research Institute Professor,MAKI NORIO	
				Graduate School of Engineering Professor,OGURA DAISUKE	
				Graduate School of Engineering Professor,MIURA KEN	
				Graduate School of Engineering Professor,DANIELL , Thomas Charles	
				Graduate School of Engineering Professor,TOMISHIMA YOSHIAKI	
				Graduate School of Engineering Professor,HIRATA AKIHISA	
				Graduate School of Engineering Professor,TAJI TAKAHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Students will learn concrete methodologies for planning and designing excellent buildings and environment, through the historical and cultural backgrounds of architecture and cities, which are necessary for architectural planning and environmental engineering, This will give you the ability to perform excellent research.					
<b>[Course objectives]</b>					
Ability to write original dissertations on cutting-edge issues in architectural planning and environmental engineering.					
<b>[Course schedule and contents]</b>					
(15 weeks)The instructors and students gives presentations on advanced research in architectural planning and environmental engineering, and discuss what it means for architecture and related disciplines, rather than sticking solely to their research, with a wide-ranging awareness of the surroundings the contents.					
<b>[Course requirements]</b>					
Students must belong to the laboratories on architectural planning or environment engineering.					
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Continue to 先端建築学特論Ⅰ (2)					

## 先端建築学特論Ⅰ(2)

### [Evaluation methods and policy]

A report summarizing the contents of the discussion will be submitted and evaluated by three faculty members.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

#### ( Related URLs )

(none)

### [Study outside of class (preparation and review)]

Investigate related references (domestic and foreign) through consultation with the instructors.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG34 5Q022 SJ74			
<b>Course title (and course title in English)</b>	先端建築学特論II Advanced Theory of Architecture and Architectural Engineering II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKEWAKI IZURU Graduate School of Engineering Professor, OOSAKI MAKOTO Graduate School of Engineering Professor, KANEKO YOSHIO Graduate School of Engineering Professor, NISHIYAMA MINEHIRO Graduate School of Engineering Professor, HAYASHI YASUHIRO Disaster Prevention Research Institute Professor, IKEDA YOSHIKI Disaster Prevention Research Institute Professor, MATSUSHIMA SHINICHI Disaster Prevention Research Institute Professor, MARUYAMA TAKASHI Graduate School of Engineering Professor, KOETAKA YUUI Disaster Prevention Research Institute Professor, Yuki Sakai	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Study the earthquake safety of building structures and the performance of structural materials. The main topics are the structural design of buildings, the structural analysis method and the evaluation of performances of advanced structural materials. The structural experiments are also discussed.					
<b>[Course objectives]</b>					
Acquire the ability to write original articles on advanced theme on structural engineering					
<b>[Course schedule and contents]</b>					
15, 15 classes, Presentation and discussion on advanced theme on structural engineering					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Grade based on the result of student effort.					
<b>[Textbooks]</b>					
Not used					
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Continue to 先端建築学特論II(2)					

## 先端建築学特論II(2)

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### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Investigate the state of the arts in the research field.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.





## デザイン方法論(2)

and if possible, a field trip will be conducted.

Regional and Residential Design (3 Classes) Dialogue-Based Approach to local society, Participation, Individual and children's participation (R. Hart), Dynamic Authenticity, which deals with the value inherent in a region by identifying unclear point structures.

Discussion (2 Classes) We will discuss the integration of each design discipline and consider the construction of new arguments for design methodologies. All teachers will take charge. Reports and feedback on each discussion will be included.

### [Course requirements]

Not specified. In principle, lectures and will be conducted at the Katsura Campus, while through may be conducted on-site in the field. The specific schedule will be announced separately.

### [Evaluation methods and policy]

As a Report Assignment, discuss "Design Methodology" through and under the guidance of four instructors. As a general rule, the Report Assignment will be administered four times.

### [Textbooks]

In addition, the course will be conducted using handouts and projector slides. (Shared on Panda)

### [References, etc.]

#### ( Reference books )

In addition, reference books will be introduced during each lesson, and a list of references will be distributed later.

### [Study outside of class (preparation and review)]

Instructions will be provided during lectures as required.

### ( Other information (office hours, etc.) )

The class schedule will be adjusted at the beginning of the second semester, and you will be notified of the same. Please see the contact coordination on Panda.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG04 5X413 LJ74				
<b>Course title (and course title in English)</b>	建築構造デザイン論 Design Theory of Architectural Structure		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, HAYASHI YASUHIRO Graduate School of Engineering Associate Professor, SUGINO MINA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>This course will discuss the following necessary components of urban and architectural structural design:</p> <p>#8226 Means of developing practical design solutions under difficult conditions or with complex design requirements</p> <p>#8226 Practical challenges and solution methods of structural design</p> <p>#8226 Ways of addressing extreme situations and meeting new challenges</p>					
<b>[Course objectives]</b>					
<p>The purpose of this course is to teach students the knowledge they need for actual architectural structural design, based on various basic theories of architectural structure (mechanics, vibrational theory, probability theory, materials science, various structures).</p>					
<b>[Course schedule and contents]</b>					
<p>Structures and structural capabilities (3 classes)</p> <p>We will discuss the structural capabilities of structures and ways of thinking about their evaluation.</p> <p>#8226 History of earthquake damage and earthquake-proofing standards, domestic-international comparison of earthquake-proofing standards, minimum levels and unexpected loads, tsunami</p> <p>#8226 Life cycle design, risk evaluation and risk management, insurance</p> <p>#8226 Capability design, capability display, capability control, damage control, monitoring, structural and non-structural capabilities, etc.</p> <p>Orientation of structural design (6 classes)</p> <p>We will discuss structural methods, construction methods, and building methods, based on case studies.</p> <p>Differences in structures depending on structural materials (concrete, iron, wood, glass, paper, plastic, soil, etc.), innovative structural materials</p> <p>Seismic isolation</p> <p>Vibration control</p> <p>Challenges related to breadth and length</p> <p>Challenges related to height</p> <p>New forms</p> <p>Creating beautiful forms</p> <p>Frameworks of living things, structures of manmade objects such as rockets, aircraft, and cars</p> <p>Regional and cultural revitalization design (2 classes)</p> <p>Preservation and revitalization of cultural properties, traditional wooden construction, historical structures</p> <p>Regional and structural design for restoration before and after earthquakes (post-disaster housing, temporary housing, tsunami shelter buildings, high functionalization and structural capabilities of cities, etc.)</p>					
Continue to 建築構造デザイン論(2)					

## 建築構造デザイン論(2)

Studying structural design case studies (3 classes)  
Two classes by outside lecturers, one field trip (tentative)

Design theme presentation (1 class)  
Based on assigned themes, students conduct presentations, then these are discussed and critiqued

### [Course requirements]

None

### [Evaluation methods and policy]

Overall grade based on attendance and presentation results of structural design themes.

### [Textbooks]

Not used  
In addition to distributing in-class printouts, reference works will be indicated in class.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Review contents of previous classes before taking every class.

### ( Other information (office hours, etc.) )

In the event that many students wish to take the course, preference may be given to students in Postgraduate Integrated Course Program of Design Studies and Architecture and Architectural Engineering.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG05 6B418 LB71 G-ENG06 6B418 LB71				
<b>Course title (and course title in English)</b>	先進材料強度論 Strength of Advanced Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, NISHIKAWA MASAOKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>The mechanism underlying mechanical and functional properties are lectured for advanced materials used and developed in advanced fields of current engineering. In particular, advanced composite materials, used for aircraft structure etc., are introduced, with a detailed description of the relationship between microscopic constituent materials and macroscopic properties from the perspective of multiscale mechanics; also the anisotropy of their properties, their fatigue and fracture properties are described in the basic discipline for strength of materials. The latest applications are introduced in the field of various transportation systems including airplanes.</p>					
<b>[Course objectives]</b>					
<p>The course goal is to understand basic concepts of composite materials and the underlying mechanism of their mechanical properties from multiscale viewpoints, while the physical understanding of composites is developed based on multiple disciplines.</p>					
<b>[Course schedule and contents]</b>					
<p>1-2. Concept of composite materials The concept and definition of composite materials, their constituent materials and manufacturing methods are illustrated. Their application to aircraft structures etc. are also introduced.</p> <p>3-4. Mechanical properties of microscopic constituent materials Resin for matrix and various fiber types are explained including their structure and mechanical properties. The weakest link model and Weibull distribution are described as a basis of the statistic nature of strength.</p> <p>5-8. Basic mechanical properties The specific strength, the specific stiffness, and the rule of mixture for elastic modulus and strength are lectured. In particular, the detailed explanation is made to the anisotropy of elastic modulus, independent elastic constants in the generalized Hookean law, the anisotropic failure criteria, and laminate theory. The relationship between the mechanical properties of microscopic constituent materials and macroscopic properties of composite materials is also illustrated.</p> <p>9-10. Micromechanics The mechanism of transverse fracture is illustrated. The mechanical models are described for short fiber reinforced composites and particle dispersed composites. The micromechanical analyses based on finite element method is also illustrated for the physical understanding of the strength of composite materials.</p> <p>11-13. Fracture mechanics properties Fracture mechanics of anisotropic materials are described. The interlaminar fracture toughness and</p>					
Continue to 先進材料強度論(2)					

## 先進材料強度論(2)

interlaminar fatigue crack propagation, the critical issues in the application of composite structures, are explained including their underlying mechanism.

### 14. Process and mechanical properties of composite materials

The molding and machining process of composite materials is explained to relate it to their mechanical properties. Fiber preform, the selection of resin, intermediate materials, machining and assembly and inspection methods are overviewed from the academic viewpoints.

### 15. Feedback

\*Academic achievement assessment (Reports)

### [Course requirements]

Mechanics of Materials, Continuum Mechanics, Fundamentals of Materials, Solid Mechanics, Adv.

### [Evaluation methods and policy]

Grading is based on the reports. The assignments will be given around three times.

### [Textbooks]

Supplementary handouts will be distributed in the class.

### [References, etc.]

#### ( Reference books )

D.Hull and T.W.Clyne, An Introduction to Composite Materials, Cambridge University Press.

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

The order and the item in the course are possibly subject to change.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG06 5G001 LJ71   G-ENG07 5G001 LJ77   G-ENG05 5G001 LJ71			
<b>Course title (and course title in English)</b>	応用数値計算法 Applied Numerical Methods		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,INOUE YASUHIRO Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Numerical techniques, such as the finite element method and numerical control method, are indispensable in mechanical engineering. In this lecture, basics of numerical techniques which are required to study advanced methods for graduated students will be explained. The lecture will cover the linear system solution ( $Ax=b$ ), eigenvalue analysis, interpolation approximation method, solutions of ordinary differential equation and partial differential equation. The programming exercise is included in this lecture.					
<b>[Course objectives]</b>					
Understandings of mathematical theories and programming implementations of the numerical methods.					
<b>[Course schedule and contents]</b>					
1. Introduction Introduction of this class - Numerical representations and errorsMacro programming using spread sheet applications 2. Linear system - MatrixNormsSingular value decomposition 3. Linear simultaneous equation(1) - Solution of simultaneous linear equationsdirect method 4. Linear simultaneous equation(2) - iteration method 5. Eigenvalue analysis(1) - Properties of eigenvalue, Eigenvalue calculation for symmetrical matrix 6. Eigenvalue analysis(2) - Eigenvalue calculation for asymmetrical matrix 7. Interpolation(1) - Polynomial, Hermite interpolation 8. Interpolation(2) - Spline interpolation, interpolation errors 9. Numerical integral(1) - Trapezoidal rule, midpoint rule, Simpson's rule, Newton-Coats rule 10.Numerical integral(2) - Complex integration rule, Romberg integral 11.Ordinary differential equation - Solutions (explicit and implicit), initial value problems and boundary values problem 12.Partial differential equation(1) - Partial differential notation, convergence conditions, von Neumann stability analysis 13.Partial differential equation(2) - Diffusion equation, wave equation					
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Continue to 応用数値計算法(2)					

## 応用数値計算法(2)

14. Partial differential equation(3)  
- Poisson equation, Laplace equation  
15. Feedback for homework and examination

### [Course requirements]

Basic mathematics for undergraduates  
Basic macro programming

### [Evaluation methods and policy]

Home works (four home works will be assigned) and examination.

### [Textbooks]

Lecture note will be distributed through the course website.

### [References, etc.]

#### ( Reference books )

Golub, G. H., Loan, C. F. V. 『Matrix Computations』 ( John Hopkins University Press ) ISBN:978-1421407944

R.D.Richtmyer and K.W.Morton 『Difference Methods for Initial-Value Problems, Second Edition』 ( John Wiley & Sons ) ISBN:978-0470720400

#### ( Related URLs )

(Lecture notes, home works, and other info will be distributed through Panda: <https://panda.ecs.kyoto-u.ac.jp>)

### [Study outside of class (preparation and review)]

Problems are based on macro on Microsoft Excel or LibreOffice and Visual C++.

### ( Other information (office hours, etc.) )

Have a PC with Microsoft Excel with VBA or LibreOffice (<https://ja.libreoffice.org/>) and Visual Studio(<https://visualstudio.microsoft.com/>)

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG05 5G003 LJ71   G-ENG06 5G003 LJ71   G-ENG07 5G003 LJ77				
<b>Course title (and course title in English)</b>	固体力学特論 Solid Mechanics, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Professor,SHIMADA TAKAHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course provides fundamental concepts of solid mechanics such as stress, strain, and constitutive laws, and methods for analyzing stress/strain fields and deformation of solids and structures on the basis of the concepts. In particular, the course lectures theories of nonlinear problems such as plasticity and creep, and their numerical solutions, or finite element methods, which are important for design and development of mechanical structures.					
<b>[Course objectives]</b>					
Students will be able to: understand solid mechanics deeply and acquire basic knowledge to design mechanical structures. analyze problems of plasticity and creep by finite element methods.					
<b>[Course schedule and contents]</b>					
Introduction,1time,Overview of solid mechanics Stress,1time,Cauchy stress tensor, Equilibrium equation, Invariants Deformation,2times,Material description and spatial description, Displacement, Deformation gradient, Lagrange-Green strain and Euler-Almansi strain, Infinitesimal strain, Material time derivative Constitutive equation: linear elasticity,1time,Linear elastic stress-strain response, Hookersquos law Principle of virtual work and principle of minimum potential energy,1time,Principle of virtual work, Principle of minimum potential energy Finite element method for linear elasticity,3times,Basis of finite element method, Finite element equilibrium equations, Elements, Numerical integration Plasticity problems,3times,Plasticity theory (uniaxial and multiaxial problems, yield criteria, flow rule, hardening rule, constitutive equations), Finite element method for elasto-plastic problems Creep problems,2times,Creep theory (uniaxial and multiaxial constitutive equations), Finite element method for creep problems Summary,1time,Discussions and reports Feedback,1time					
<b>[Course requirements]</b>					
This course requires basic knowledge of mechanics of materials and solid mechanics.					
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Continue to 固体力学特論(2)					



## 固体力学特論(2)

### [Evaluation methods and policy]

Grading is based on the examination, possibly with considerations of the homework reports.

### [Textbooks]

Lecture materials are distributed in the classroom.

### [References, etc.]

#### ( Reference books )

T. Kyoya, Continuum Mechanics, Morikita (2008) (in Japanese) Y. Tomita, "Foundation and Application of Elastoplasticity" Morikita (1995) (in Japanese) E. Neto et al., "Computational Methods for Plasticity," John Wiley & Sons (2008).

### [Study outside of class (preparation and review)]

Preparation and review of lecture materials. Exercises.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG06 5G005 LJ71   G-ENG07 5G005 LJ77   G-ENG05 5G005 LJ71				
<b>Course title (and course title in English)</b>	熱物理工学 Thermal Science and Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, MATSUMOTO MITSUHIRO Graduate School of Engineering Professor, IWAI HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Several topics in advanced thermal physics are discussed. From microscopic view points, basics of stochastic process and related topics are given. From macroscopic ones, after the concept of entropy is revisited, applications in global environments and hydrogen energy are described.					
<b>[Course objectives]</b>					
Microscopic Viewpoints: Ability of multi-scale modelling Macroscopic Viewpoints: Ability of global environment modelling					
<b>[Course schedule and contents]</b>					
(M) Brownian Motion, 1time, (M) Transport Phenomena and Correlation Functions, 1time, (M) Spectral Analysis and Fractal Analysis, 2times, (M) Stochastic Process and Its Applications, 3times, (Y) Science of Atmosphere and Ocean, 5times, (Y) Science of Hydrogen Energy, 1time, (Y) Science of Nuclear Energy, 1time, Check and feedback, 1time,					
<b>[Course requirements]</b>					
Elementary thermodynamics, Statistical physics, Heat transfer engineering, Numerical analysis etc.					
<b>[Evaluation methods and policy]</b>					
Reports					
<b>[Textbooks]</b>					
handout					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
Not necessary					
( <b>Other information (office hours, etc.)</b> )					
(2018) Matsumoto: April 8 ~ May 22 Yoshida: June 3 ~ July 22  *Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG06 5G007 LJ71   G-ENG07 5G007 LJ77   G-ENG05 5G007 LJ71				
<b>Course title (and course title in English)</b>	基盤流体力学 Introduction to Advanced Fluid Dynamics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,HANAZAKI HIDESHI Graduate School of Engineering Professor,TAKATA SHIGERU Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
, 5 times, , 5 times, , 4 times, , 1 times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG06 5G009 LJ71   G-ENG07 5G009 LJ77   G-ENG05 5G009 LJ71				
<b>Course title (and course title in English)</b>	量子物性物理学 Quantum Condensed Matter Physics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, SENAMI MASATO Graduate School of Engineering Associate Professor, NAKAJIMA KAORU Graduate School of Engineering Associate Professor, SHIKAMA TAIICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,3times, ,4times, ,1time, ,1time, ,1time, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG05 5G011 LJ71   G-ENG07 5G011 LJ77   G-ENG06 5G011 LJ71			
<b>Course title (and course title in English)</b>	設計生産論 Design and Manufacturing Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Associate Professor,IZUI KAZUHIRO Graduate School of Engineering Program-Specific Associate Professor,BEAUCAMP, Anthony Tadeus Herve Graduate School of Engineering Professor,NISHIWAKI SHINJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,2times, ,3times, ,2times, ,3times, ,2times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG05 5G013 LJ71   G-ENG06 5G013 LJ71   G-ENG07 5G013 LJ77				
<b>Course title (and course title in English)</b>	動的システム制御論 Dynamic Systems Control Theory		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SAWARAGI TETSUO Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI Graduate School of Engineering Professor,FUJIMOTO KENJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,5times, ,5times, ,4times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG05 7G041 LE71    G-ENG06 7G041 LE71			
<b>Course title (and course title in English)</b>	有限要素法特論 Advanced Finite Element Method		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,NISHIWAKI SHINJI Graduate School of Engineering Senior Lecturer,Lim,    Sunghoon	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course presents the basic concept and mathematical theory of the Finite Element Method (FEM), and explains how the FEM is applied in engineering problems. We also address important topics such as the physical meaning of geometrical non-linearity, material non-linearity, and non-linearity of boundary conditions, and we explore numerical methods to deal with these nonlinearities. Also, we guide students in class in the use of software to solve several numerical problems, to develop practical skill in applying the FEM to engineering problems.					
<b>[Course objectives]</b>					
The course goals are for students to understand the mathematical theory of the FEM and the numerical methods for analyzing non-linear problems based on the FEM.					
<b>[Course schedule and contents]</b>					
<p>Basic knowledge of the FEM,3times,What is the FEM? The history of the FEM, classifications of partial differential equations, linear problems and non-linear problems, mathematical descriptions of structural problems (stress and strain, strong form and weak form, the principle of energy).</p> <p>Mathematical background of the FEM,2times,Variational calculus and the norm space, the convergence of the solutions.</p> <p>FEM formulations,3times,FEM approximations for linear problems, formulations of iso-parametric elements, numerical instability problems such as shear locking, formulations of reduced integration elements, non-conforming elements, the mixed approach, and assumed-stress elements.</p> <p>Classifications of nonlinearities and their formulations,4times,Classifications of nonlinearities and numerical methods to deal with these nonlinearities.</p> <p>Numerical practice,2times,Numerical practice using COMSOL.</p> <p>Evaluation of student achievements,1time,</p>					
<b>[Course requirements]</b>					
Solid Mechanics					
<b>[Evaluation methods and policy]</b>					
Grading is based the quality of two or three reports and the final exam.					
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Continue to 有限要素法特論(2)					

## 有限要素法特論(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Bath, K.-J., Finite Element Procedures, Prentice Hall  
Belytschko, T., Liu, W. K., and Moran, B., Nonlinear Finite Elements for Continua and Structures, Wiley

### [Study outside of class (preparation and review)]

N/A

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG05 6G049 PJ71 G-ENG06 6G049 PJ71				
<b>Course title (and course title in English)</b>	インターンシップM (機械工学群) Engineering Internship M		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor, KUROSE RYOUICHI	
<b>Target year</b>	1st year students or above	<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>The aim of the internship is experiencing on-site activities involved production, manufacturing, development, designing and research of industrial goods at a factory or a research laboratory of Japanese leading companies.</p> <p>On-site learning of the importance of teamwork and production processes in manufacturing is also the aim.</p>					
<b>[Course objectives]</b>					
<p>The goal of the internship is to master a general method of thinking and methodology at Mechanical Engineering. Furthermore, by learning the relationship between a human and machines at an industry, motivate oneself to study and think about one's career development.</p>					
<b>[Course schedule and contents]</b>					
<p>As a general rule, the internship should meet the above purpose. The duration should be not less than two weeks. Thus, the following cases are not approved as an internship; a short internship such as a week, a company tour, a company explanation meeting and so on. Longer term more than two weeks and an overseas internship such as IAESTE can be acceptable.</p> <p>Internship location: Based on recruitment from companies. You can find them at company's web sites and/or the educational affairs office of the Engineering Science office (Butsuri Kyoumu).</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Credits (2) are approved based on the summary report (50%) and presentation (50%) about the internship activities.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
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Continue to インターンシップM (機械工学群) (2)					

インターンシップM ( 機械工学群 ) (2)

**[Study outside of class (preparation and review)]**

Consult with the internship host location.

**( Other information (office hours, etc.) )**

Pre-registration at the educational affairs office of the Engineering Science (Butsuri Kyoumu) is required.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG36 7G056 LE71   G-ENG06 7G056 LE71   G-ENG35 7G056 LE71 G-ENG05 7G056 LE71				
<b>Course title (and course title in English)</b>	English Technical Writing English Technical Writing		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,NISHIWAKI SHINJI Part-time Lecturer,Wever Steve	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>大学院学生にとって、英語により論文執筆する知識・能力を得ることは必須課題である。本講義では、英語による技術論文の執筆の仕方について、演習を踏まえながら講義を行う。すわなち、論文を執筆する際に必要となる、英語論文の常識、論文の構成方法、アブストラクト・緒言・結論のまとめ方、図・方法の記載方法、更にはより理解を深める英語の表現方法について、演習を交えながら、講述する。</p>					
<b>[Course objectives]</b>					
英語の論文を構成・執筆できる十分な知識と能力を習得する。					
<b>[Course schedule and contents]</b>					
<p>1) What Is Technical Writing? This class will provide an introduction to technical writing with specific examples showing the difference between general and technical English, as well as a review of the grammar forms that are important for technical writing.</p> <p>2) The Patterns of General to Specific and Comparison and Contrast Writing well-organized paragraphs is important for communicating your ideas clearly and efficiently. This class will provide students with two common patterns used for organizing paragraphs: 1) starting the paragraph with a general idea and then expanding on this with more specific detail, and 2) describing how things are the same and how they are different.</p> <p>3) The Patterns of Cause and Effect and Sequencing This class will provide students with two more common patterns used for organizing paragraphs: 1) showing the connection between an effect and its cause, and 2) describing a sequence of steps in a process.</p> <p>4) Definitions and Describing Products In technical writing it is essential to be able to write accurate descriptions of various aspects of your research. This class will focus on how to write clear and understandable definitions of your work as well as accurately describe the characteristics of items and products.</p> <p>5) The Introduction Section This class will focus on what information is required for a good introduction to your research. Students will begin writing the Introduction section to their research.</p> <p>6) The Experimental Section</p>					
Continue to English Technical Writing (2)					

## English Technical Writing (2)

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This class will examine what features and language are required for the experimental section of a paper. Students will begin writing the Experimental section to their research.

### 7) Describing Graphs and Other Visuals

There are many kinds of figures and graphs required for technical papers. When presenting figures and graphs, you cannot just simply show them, you must also describe them in words. This class will help students describe changes over time in graphs as well as the relationship between 2 variables.

### 8) The Discussion Section

It is not enough just to present data. Good technical writing should also interpret the results, discuss their importance and make recommendations for action or future research. This class will focus on how to write a good Discussion section of a technical paper. Students will begin writing the Discussion section to their research.

### 9) The Conclusion Section

The Conclusion section is very important because it is one of the most read sections of the report. This class will focus on how to organize and write a good Conclusion for your paper. Students will begin writing the Conclusion section to their research.

### 10) The Title and Abstract

A good title and abstract are essential for describing the content of your report. This class will focus on how to write good titles and abstracts. Students will begin writing the Titles and Abstract section to their research.

### 11) Resumes - Part 1

A resume is a written description of you that potential employers, etc., use as an important first evaluation of your background, experience and accomplishments. This class will examine what information is generally given in a resume, and how to present this information in an effective manner. Students will begin writing resumes about themselves.

### 12) Resumes - Part 2

This is a workshop session where students will work together and with the instructor to evaluate the other students' resumes and give feedback on improvements they can make. The goal of this class will be for each student to have a good draft resume prepared for their future use.

### 13) Final Paper Preparation

This is a workshop session where students will work together and with the instructor to evaluate the other students' final papers and give feedback on improvements they can make. The goal of this class will be for each student to have a good draft final paper prepared to finalize for the next week.

### 14) Final Paper Submission and Class Wrap-up

Students will submit their final papers about their research. There will be a review of the semester course work with final comments and questions.

### 15) 学修到着度の確認

学修到達度の確認の後に、フィードバックを行う。

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Continue to English Technical Writing (3)

## English Technical Writing (3)

### [Course requirements]

None

### [Evaluation methods and policy]

期末試験とレポート課題による。

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

講義資料による予習・復習を充分行うこと。

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG05 8G057 LJ71   G-ENG06 8G057 LJ71   G-ENG07 5G057 LJ77				
<b>Course title (and course title in English)</b>	技術者倫理と技術経営 Engineering Ethics and Management of Technology		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,NISHIWAKI SHINJI Graduate School of Engineering Professor,SAWARAGI TETSUO Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI Graduate School of Engineering Professor,KOMORI MASAHARU Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Program-Specific Professor,IWASAKI TAKASHI Graduate School of Engineering Program-Specific Associate Professor,HIRAI TAKASHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Basic knowledge of Engineering Ethics and Management of Technology needed for future project leaders in companies and society is taught. Students have to make group work after-class hours as well as presentations of wrapping-up the discussions. Engineering ethics is the field of applied ethics and system of moral principles that apply to the practice of engineering. The field examines and sets the obligations by engineers to society, to their clients, and to the profession. Management of Technology is a set of management disciplines that allows organizations to manage their technological fundamentals to create competitive advantage. This course consists of lectures, exercises, discussions and oral presentations under supervision of professional faculties and extramural lecturers.					
<b>[Course objectives]</b>					
To cultivate a spirit of self-sufficiency needed for engineers					
<b>[Course schedule and contents]</b>					
Engineering Ethics,9times,1. Introduction to Engineering Ethics (EE)2.Medical Engineering Ethics3.EE by Institution of Professional Engineers, Japan and abroad4.Product Safety and Product Liability5. Comprehensive Manufacturing and EE (1) 6.Comprehensive Manufacturing and EE (2)7.Group Discussions8. History and Philosophy of EE9.Presentation on exercise of EE Management of Technology,5times,1.Product Portfolio, Strategy for Competition2.Bussiness Domain and MOT for Marketing3. Organizational Strategy for Corporates#039 R amp D4. Management Theory for R amp D5.Presentation on exercise of MOT Summary,1time,					
<b>[Course requirements]</b>					
Nothing particular					
Continue to 技術者倫理と技術経営(2)					

## 技術者倫理と技術経営(2)

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### [Evaluation methods and policy]

Submission of reports and presentations

### [Textbooks]

No textbook

### [References, etc.]

#### ( Reference books )

Nothing

#### ( Related URLs )

(No Web Site)

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

Nothing particular

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG06 5G058 SJ71 G-ENG05 5G058 SJ71				
<b>Course title (and course title in English)</b>	複雑系機械工学基礎セミナー 1 Basic Seminar of Complex Mechanical Engineering,1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,YOKOKAWA RYUUI Graduate School of Engineering Associate Professor,MARUTA ICHIROU Graduate School of Engineering Senior Lecturer,OKINO SHINYA	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar provides master-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multidisciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.					
<b>[Course objectives]</b>					
Students will be able to acquire presentation and logical thinking skills.					
<b>[Course schedule and contents]</b>					
Self introduction,1-2times, Organizing groups,1time, Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required. Final presentation,1-2times,Each group gives presentation of its final results.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on Group Activity Reports and Personal Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
<b>( Other information (office hours, etc.) )</b>					
All activities should be done in English. Registration is required by the deadline. Contact at cme-seminar@me.kyoto-u.ac.jp					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG06 5G059 SJ71 G-ENG05 5G059 SJ71				
<b>Course title (and course title in English)</b>	複雑系機械工学基礎セミナー 2 Basic Seminar of Complex Mechanical Engineering,2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Associate Professor,NISHIKAWA MASAOKI Graduate School of Engineering Associate Professor,KISHIMOTO MASASHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.1	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar provides master-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multidisciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.					
<b>[Course objectives]</b>					
Students will be able to acquire presentation and logical thinking skills.					
<b>[Course schedule and contents]</b>					
Self introduction,1-2times, Organizing groups,1time, Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required. Final presentation,1-2times,Each group gives presentation of its final results.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on Group Activity Reports and Personal Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
<b>( Other information (office hours, etc.) )</b>					
All activities should be done in English. Registration is required by the deadline. Contact at cme-seminar@me.kyoto-u.ac.jp					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG06 5G061 LJ71 G-ENG05 5G061 LJ71			
<b>Course title (and course title in English)</b>	応用数理科学 Applied mathematical sciences		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,INOUE YASUHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
数理科学は、様々な分野における数理的な課題解決に応用されている。特に、支配法則が明確でない複雑性の高い現象や不確実性を伴う現象を理解し予測する上では、数学的アイデアにもとづく数理モデルの構築が重要となる。本講義では、このような応用的な観点から、数理科学の実践について学ぶ。					
<b>[Course objectives]</b>					
数理的な課題解決に必要な共通の考え方について学び、微分方程式および確率・統計を用いた数理モデル構築の技術に習熟する。					
<b>[Course schedule and contents]</b>					
概論（１） 数理モデルの構築に必要な考え方を学ぶ。					
微分方程式による数理モデル（５）線形微分方程式および非線形微分方程式の観点から、数理モデルを紹介し、少数の共通した数理モデルにより、広範な分野における非常に多様な現象を表現することができることを学ぶ。					
確率・統計による数理モデル（６）不確実性を伴う現象を理解する上で重要となる確率・統計の考え方を紹介し、確率微分方程式による数理モデルの構築や種々のデータに基づく統計モデルの構築の基礎を学ぶ。					
グループワーク（２）支配法則が明確でない諸現象に対して、数理モデルによる課題解決の実践をグループワークにより行う。数理的な課題解決プロセスを体験することにより、数理モデルの構築に必要な考え方の取得を目指す。					
学修到着度の確認(1) 学修到達度の確認を行う。					
<b>[Course requirements]</b>					
微積分、確率・統計に関する基本的な知識					
<b>[Evaluation methods and policy]</b>					
講義中に行うグループワークおよびレポート試験による。					
<b>[Textbooks]</b>					
Not used					
Continue to 応用数理科学(2)					

## 応用数理科学(2)

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### [References, etc.]

#### ( Reference books )

Introduced during class

#### ( Related URLs )

<https://github.com/yasuhiroinoue/AppMathSci>(講義資料 ( 予習・復習用 ) )

### [Study outside of class (preparation and review)]

講義資料による復習を充分行うこと。

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG05 7K013 LE71   G-ENG06 7K013 LE71   G-ENG07 6K013 LE77			
<b>Course title (and course title in English)</b>	先端機械システム学通論 Advanced Mechanical Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUNO FUMITOSHI Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Professor,SHIMADA TAKAHIRO Graduate School of Engineering Professor,KOMORI MASA HARU Graduate School of Engineering Associate Professor,MATSUMOTO MITSUHIRO Graduate School of Engineering Professor,TAKATA SHIGERU Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Senior Lecturer,Arseniy Aleksandrovich , Kuzmin Graduate School of Engineering Professor,YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.5,Thu.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Lectures on recent topics in various fields of mechanical engineering will be given in English. This is mainly for foreign students (MC/DC), but Japanese students are also welcome.					
<b>[Course objectives]</b>					
The aim of this course is to acquire a mechanical-engineering way of viewing/understanding different phenomena and advanced topics based on the principles of mechanics.					
<b>[Course schedule and contents]</b>					
Topics in the following fields will be provided in an omnibus style. The actual order of the topics and the schedule of lectures will be announced before the course starts. (1) Mechanics of materials, 2 lectures (2) Dynamics and control, 2 lectures (3) Thermodynamics, 2 lectures (4) Fluid dynamics, 2 lectures (5) Design and manufacturing, 2 lectures (6) Micro engineering, 2 lectures (7) Biomechanics, 2 lectures (8) Feedback					
<b>[Course requirements]</b>					
None					
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Continue to 先端機械システム学通論(2)					

## 先端機械システム学通論(2)

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### [Evaluation methods and policy]

Grading is based on the homework reports and the class-room discussions.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Enrolled students should review the lecture materials and work on the homework reports.

### ( Other information (office hours, etc.) )

This course is given every two years. It will be given in the academic year 2022.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG05 7V003 LB71 G-ENG06 7V003 LB71				
<b>Course title (and course title in English)</b>	バイオメカニクス Biomechanics		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Life and Medical Sciences Professor, ADACHI TAIJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This lecture will be provided in Japanese.					
<p>生体は、器官、組織、細胞、分子に至る階層的な構造を有しており、各時空間スケール間に生じる相互作用から生み出される構造・機能の関連を理解する上で、力学的なアプローチが有用である。このような生体のふるまいは、力学的な法則に支配されるが、工業用材料とは異なり、物質やエネルギーの出入りを伴うことで、自ら力学的な環境の変化に応じてその形態や特性を機能的に適応変化させる能力を有する。このような現象に対して、従来の連続体力学等の枠組みを如何に拡張し、それを如何に工学的な応用へと結びつけるかについて、最新のトピックスを取り上げながら議論する。</p>					
<b>[Course objectives]</b>					
This lecture will be provided in Japanese.					
<p>生体の持つ構造・機能の階層性や適応性について、力学的・物理学的な視点から理解し、生物学・医学などとの学域を越えた研究課題の設定や解決策の議論を通じて、新しいバイオメカニクス・メカノバイオロジー研究分野の開拓に挑戦する準備を整える。</p>					
<b>[Course schedule and contents]</b>					
1time: Introduction to Biomechanics 2times: Discussion: Roles of forces in biomechanics and mechanobiology 4times: Discussion: Recent topics on Biomechanics 4times: Discussion: Application to biomedical engineering 4times: Presentation and discussion: Proposal of biomechanics research					
<b>[Course requirements]</b>					
None					
<div style="text-align: right;">Continue to バイオメカニクス(2)</div>					

## バイオメカニクス(2)

### [Evaluation methods and policy]

This lecture will be provided in Japanese.

バイオメカニクス，バイオエンジニアリングに関する特定の共通テーマに対して，各自が個々に調査した内容について討論すると共に，最終的なレポートとその発表・討論に対して相互に評価を行い，それらを通じて学習到達度の確認を行う．

### [Textbooks]

Not used

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

講義で取り上げられるテーマについて、レビュー・調査および発表準備

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG35 6V019 PJ71 G-ENG34 6V019 PJ71			
<b>Course title (and course title in English)</b>	インターンシップDS ( 機械工学群 ) Engineering Internship DS		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor, KUROSE RYOUICHI	
<b>Target year</b>	1st year students or above	<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The purpose is to experience advanced studies related to mechanical engineering by the relatively long term research in domestic or foreign companies, universities and institutes, etc., and to learn the way of thinking and methodology.					
<b>[Course objectives]</b>					
The goal of the internship is to master a general method of thinking and methodology at Mechanical Engineering. Furthermore, motivate oneself to study and think about one's career development and to develop communication skill in group work and in international network.					
<b>[Course schedule and contents]</b>					
As a general rule, the internship should meet the above purpose. The duration should be not less than 12 weeks. Submission of a report and presentation in a report meeting after you finish the internship are required.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Credits (4) are approved based on the summary report (50%) and presentation (50%) about the internship activities.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Consult with the internship host location.					
<b>( Other information (office hours, etc.) )</b>					
Pre-registration at the educational affairs office of the Engineering Science (Butsuri Kyoumu) is required.					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>		G-ENG34 6V020 PJ71 G-ENG35 6V020 PJ71			
<b>Course title (and course title in English)</b>	インターンシップDL ( 機械工学群 ) Engineering Internship DL		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor, KUROSE RYOUICHI	
<b>Target year</b>	1st year students or above	<b>Number of credits</b>	6	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The purpose is to experience advanced studies related to mechanical engineering by the relatively long term research in domestic or foreign companies, universities and institutes, etc., and to learn the way of thinking and methodology.					
<b>[Course objectives]</b>					
The goal of the internship is to master a general method of thinking and methodology at Mechanical Engineering. Furthermore, motivate oneself to study and think about one's career development and to develop communication skill in group work and in international network.					
<b>[Course schedule and contents]</b>					
As a general rule, the internship should meet the above purpose. The duration should be not less than 24 weeks. Submission of a report and presentation in a report meeting after you finish the internship are required.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Credits (6) are approved based on the summary report (50%) and presentation (50%) about the internship activities.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Consult with the internship host location.					
<b>( Other information (office hours, etc.) )</b>					
Pre-registration at the educational affairs office of the Engineering Science (Butsuri Kyoumu) is required.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG34 7V025 SE71   G-ENG35 7V025 SE71				
<b>Course title (and course title in English)</b>	複雑系機械工学セミナー A Seminar of Complex Mechanical Engineering for the 21st Century COE Program,A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,YOKOKAWA RYUUI Graduate School of Engineering Associate Professor,MARUTA ICHIROU Graduate School of Engineering Senior Lecturer,OKINO SHINYA	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.					
<b>[Course objectives]</b>					
Students will be able to acquire presentation and logical thinking skills.					
<b>[Course schedule and contents]</b>					
Self introduction,1-2times, Organizing groups,1time, Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required. Final presentation,1-2times,Each group gives presentation of its final results.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on Group Activity Reports and Personal Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
<b>( Other information (office hours, etc.) )</b>					
All activities should be done in English. Registration is required by the deadline. Contact at cme-seminar@me.kyoto-u.ac.jp					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG34 7V027 SE71 G-ENG35 7V027 SE71				
<b>Course title (and course title in English)</b>	複雑系機械工学セミナー B Seminar of Complex Mechanical Engineering for the 21st Century COE Program,B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Associate Professor,NISHIKAWA MASAOKI Graduate School of Engineering Associate Professor,KISHIMOTO MASASHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.1	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.					
<b>[Course objectives]</b>					
Students will be able to acquire presentation and logical thinking skills.					
<b>[Course schedule and contents]</b>					
Self introduction,1-2times, Organizing groups,1time, Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required. Final presentation,1-2times,Each group gives presentation of its final results.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on Group Activity Reports and Personal Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
<b>( Other information (office hours, etc.) )</b>					
All activities should be done in English. Registration is required by the deadline. Contact at cme-seminar@me.kyoto-u.ac.jp					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG34 7V029 SE71 G-ENG35 7V029 SE71				
<b>Course title (and course title in English)</b>	複雑系機械工学セミナー C Seminar of Complex Mechanical Engineering for the 21st Century COE Program,C		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,YOKOKAWA RYUUI Graduate School of Engineering Associate Professor,MARUTA ICHIROU Graduate School of Engineering Senior Lecturer,OKINO SHINYA	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.					
<b>[Course objectives]</b>					
Students will be able to acquire presentation and logical thinking skills.					
<b>[Course schedule and contents]</b>					
Self introduction,1-2times, Organizing groups,1time, Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required. Final presentation,1-2times,Each group gives presentation of its final results.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on Group Activity Reports and Personal Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
<b>( Other information (office hours, etc.) )</b>					
All activities should be done in English. Registration is required by the deadline. Contact at cme-seminar@me.kyoto-u.ac.jp					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG34 7V031 SE71 G-ENG35 7V031 SE71				
<b>Course title (and course title in English)</b>	複雑系機械工学セミナー D Seminar of Complex Mechanical Engineering for the 21st Century COE Program,D		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Associate Professor,NISHIKAWA MASAOKI Graduate School of Engineering Associate Professor,KISHIMOTO MASASHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.1	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.					
<b>[Course objectives]</b>					
Students will be able to acquire presentation and logical thinking skills.					
<b>[Course schedule and contents]</b>					
Self introduction,1-2times, Organizing groups,1time, Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required. Final presentation,1-2times,Each group gives presentation of its final results.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on Group Activity Reports and Personal Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
<b>( Other information (office hours, etc.) )</b>					
All activities should be done in English. Registration is required by the deadline. Contact at cme-seminar@me.kyoto-u.ac.jp					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG34 7V033 SE71 G-ENG35 7V033 SE71				
<b>Course title (and course title in English)</b>	複雑系機械工学セミナー E Seminar of Complex Mechanical Engineering for the 21st Century COE Program,E		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,YOKOKAWA RYUUJI Graduate School of Engineering Associate Professor,MARUTA ICHIROU Graduate School of Engineering Senior Lecturer,OKINO SHINYA	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.					
<b>[Course objectives]</b>					
Students will be able to acquire presentation and logical thinking skills.					
<b>[Course schedule and contents]</b>					
Self introduction,1-2times, Organizing groups,1time, Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required. Final presentation,1-2times,Each group gives presentation of its final results.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on Group Activity Reports and Personal Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
<b>( Other information (office hours, etc.) )</b>					
All activities should be done in English. Registration is required by the deadline. Contact at cme-seminar@me.kyoto-u.ac.jp					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG34 7V035 SE71 G-ENG35 7V035 SE71			
<b>Course title (and course title in English)</b>	複雑系機械工学セミナー F Seminar of Complex Mechanical Engineering for the 21st Century COE Program,F		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Associate Professor,NISHIKAWA MASAOKI Graduate School of Engineering Associate Professor,KISHIMOTO MASASHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.1	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.					
<b>[Course objectives]</b>					
Students will be able to acquire presentation and logical thinking skills.					
<b>[Course schedule and contents]</b>					
Self introduction,1-2times, Organizing groups,1time, Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required. Final presentation,1-2times,Each group gives presentation of its final results.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on Group Activity Reports and Personal Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
<b>( Other information (office hours, etc.) )</b>					
All activities should be done in English.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG06 8X402 LB18 G-ENG05 8X402 LB18				
<b>Course title (and course title in English)</b>	アーティファクトデザイン論 Theory for Designing Artifacts		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SAWARAGI TETSUO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The object of the design covers a wide range such as machinery, building, information systems, social system, etc. In this lecture, we first clarify the concept of "artifacts" and discuss the science of design for dealing with things and phenomena that combine the laws of nature and human purposes. The course aims to clarify the principles common to various types of design, including function, familiarity, usability, aesthetics, and innovation, among others.					
<b>[Course objectives]</b>					
The goal is to understand artifacts' design principles and learn to use systematic thinking and analyses to identify problems and conceive solutions.					
<b>[Course schedule and contents]</b>					
<p>Introduction:</p> <p>The course first clarifies the concept of "artifacts" as something to be positioned equally with natural objects. It then discusses the history of "artifacts for representation" in ancient times, "artifacts for survival" in medieval times, "artifacts for convenience" in modern times, and "artifacts for sustainment" in each period.</p> <p>Function and purpose of the artifact (3 lectures):</p> <p>These cover the effect of artifacts on the outside world?their function, reason for existence, and why they were created. We discuss the categorization of artifacts and their formation from the viewpoint of the symbolic process (semiotics) and the "purpose" of artifacts in the context in which they are used.</p> <p>Design principles of artifacts (2 lectures):</p> <p>Understanding artifacts requires knowing how their internal structures function in the outside world. We discuss cybernetics (the field concerned with circular causality in both the physical world and the world of information) and second-order cybernetics (recursive cybernetics) in the social sciences, design research, human cognition, and decision making. Cybernetics positively considers and reconsiders interactions in areas like the ecological approach, social dispersal cognition, and naturalistic decision making. These lectures describe the design principles of artifacts based on theories on human behavior.</p> <p>Representation and evaluation for the design of artifacts (3 lectures):</p> <p>Designs must not be confined to individual artifacts; instead, they should generate environmental and social systems, including artifacts and natural objects, and improve the quality of life. These lectures discuss methods for identifying problems, setting design objectives, resolving vagueness and goal conflicts, creating alternative designs, and evaluating designs. They also cover consensus-building among multiple parties</p>					
----- Continue to アーティファクトデザイン論(2) -----					



## アーティファクトデザイン論(2)

involved in expanding design objects beyond hardware to environmental and social systems, including soft services.

User-centric artifact design (2 lectures):

The ultimate arbiters of design quality are the users. Successful design requires cooperation between designers, producers, and end-users. Complex design problems cannot be solved solely by narrowly focused specialists; sharing design knowledge among different fields is essential. These lectures discuss the internationally recognized standards in design processes and the concepts of "design rationale" and "user-centered design."

Participatory systems approach (2 lectures):

In dealing with the design of large-scale and complicated artifacts, the idea of systematizing the problem and advancing it from many viewpoints becomes essential. These lectures outline the interactive process between system designers, users, and computers, including the structured modeling technique of problem-solving through repeated interactions between experts. It discusses techniques for interpreting and evaluating user input in design decision-making to highlight the benefits of the participatory systems approach to product design.

Two hands-on exercises of the participatory systems approach:

Students will address design problems in real-world artifacts and practice using the participatory systems approach to find solutions.

### [Course requirements]

Nothing in particular

### [Evaluation methods and policy]

Grading method:

Exercises during the lecture period: about 20%

End-of-term exam: about 60%

Classroom contributions (e.g., asking good questions): about 20%

### [Textbooks]

Other lecture notes used in classes will be distributed as appropriate.

See "Reference books" below.

### [References, etc.]

#### ( Reference books )

Reference books:

1. Hiroyuki Yoshikawa (2007) Horizontal trunk, Artefacts 1(2), 59-65.
2. Nam Pyo Suh (1990) The Principles of Design, Oxford University Press; (1992) Creative Mechanical Design Theory, Asakura Shoten.
3. Hiroyuki Yoshikawa (1979) Introduction to General Design, Precision Machinery 45(8), 20-26.
4. Vladimir Hubka and W. Ernst Eder (1995) Design Science, Springer.

Continue to アーティファクトデザイン論(3)

## アーティファクトデザイン論(3)

5. Herbert A. Simon (1996) The Sciences of the Artificial (3rd ed.), MIT Press; Herbert A. Simon (1999) The Science of Systems, Personal Media, translated by Motoyoshi Akiba and Hideki Yoshihara.
6. Herbert A. Simon (1979) Decision Science, University of Industrial Efficiency Press, translated by Motoyoshi Inaba and Takeo Kurai.
7. Edwin Hutchins (1995) Cognition in the Wild, MIT Press
8. Gary Klein, Judith Orasanu, Roberta Calderwood, and Caroline E. Zsombok, C.E. (1993) Decision Making in Action: Models and Methods, Ablex Publishing Co.
9. Don Norman (1986) The Design of Everyday Things, basic books, translated by Hisao Nojima; Design Principles of Cognitive Scientists, Shinyosha.
10. Kawamura Sawaragi (1981) Participatory Systems Approach: Methods and Applications, Nikkan Kogyo Shimbun.

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

In principle, office hours will be one hour before and after the class hours (5 p.m. on Tuesday, 3 p.m. on the second Wednesday). For other times, please make an appointment via email.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG07 6X411 LJ77   G-ENG05 6X411 LB71   G-ENG06 6X411 LB71			
<b>Course title (and course title in English)</b>	複雑系機械システムのデザイン Design of Complex Mechanical Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SAWARAGI TETSUO Institute for Life and Medical Sciences Professor,ADACHI TAIJI Graduate School of Engineering Professor,NISHIWAKI SHINJI Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,KOMORI MASAHARU Graduate School of Engineering Professor,SHIMADA TAKAHIRO Graduate School of Engineering Professor,HIRAYAMA TOMOKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,2times, ,2times, ,2times, ,2times, ,2times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
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Continue to 複雑系機械システムのデザイン(2)					

## 複雑系機械システムのデザイン(2)

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### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG05 6B407 LB71				
<b>Course title (and course title in English)</b>	ロボティクス Robotics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUNO FUMITOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Understanding of intelligent behaviors of living things is very interesting. And realization of their intelligent motion by a robot is also attractive for mechanical engineering. In this lecture, we consider basic understanding of beautiful human skill "manipulation" on the point of view of dynamics and control. First modeling methodologies for a rigid multibody system and a general dynamic model of a manipulator are provided. Next, a typical nonlinear control law is introduced and some problems for applying the controller are shown. Based on nature of the dynamics of the manipulator, a very simple and robust controller can be derived by designing energy of the system. This lecture provides modeling methodologies and controller design strategies of the rigid multibody system and we analyze a beautiful human skill of the manipulation.</p>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,4times, ,1time, ,3times, ,3times, ,2times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
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Continue to ロボティクス(2)					

ロボティクス(2)

[Textbooks]

[References, etc.]

( Reference books )

[Study outside of class (preparation and review)]

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG05 6B622 LB71			
<b>Course title (and course title in English)</b>	熱物性論 Thermophysics for Thermal Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,MATSUMOTO MITSUHIRO Graduate School of Engineering Professor,KUROSE RYOUICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Based on elementary thermodynamics and statistical physics, I will describe non-equilibrium thermodynamics and advanced statistical physics, including phase transition, pattern formation, and entropy production.					
<b>[Course objectives]</b>					
Understanding the principle mechanisms of phase transition, cooperation phenomena, pattern formation, and relaxation phenomena, in terms of advanced statistical mechanics and non-equilibrium thermodynamics.					
<b>[Course schedule and contents]</b>					
Elementary statistical physics: review,1time,Review of equilibrium statistical mechanics Phase transition as a cooperative phenomenon,3times,Statistical mechanics of interacting particle system - Exact calculation - Monte Carlo simulation - Mean field approximation Pattern formation of non-equilibrium systems,3times,After a time dependent Ginzburg-Landau (TDGL) model is introduced, formation of spatial patterns is discussed from various viewpoints. Equilibrium thermodynamics: review,2times,Review of elementary thermodynamics Non-equilibrium thermodynamics: Basics,5times,System stability and the principle of irreversible process are discussed in terms of thermodynamics. Non-equilibrium thermodynamics: Applications,3times,- Entropy production - Linear response theory - Onsager's reciprocal relation Check and Feedback,1time,					
<b>[Course requirements]</b>					
Undergraduate level of Thermophysics, Heat transfer phenomena, and Statistical physics					
<b>[Evaluation methods and policy]</b>					
Paper assignments					
<b>[Textbooks]</b>					
Lecture note will be prepared.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) will be listed in the class.					
<b>[Study outside of class (preparation and review)]</b>					
Exercises with simple numerical simulations are given.					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG35 7B629 LJ71    G-ENG05 7B629 LJ71			
<b>Course title (and course title in English)</b>	量子ビーム物質解析学 Analysis of Materials by Quantum Beams		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science Professor, OKUCHI TAKEO Institute for Integrated Radiation and Nuclear Science Assistant Professor, ONODERA YUHEI Institute for Integrated Radiation and Nuclear Science Assistant Professor, UMEDA YUHEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>炭とダイヤモンドは、同じ炭素でできていても、大きく物質としての性質が異なる。この違いは炭素の原子スケールの配列の違いに起因する。本講義では、近年の発達が著しい量子ビームを使って、物質の原子スケールの状態を解析する方法についての学修を行い、そこから硬さや電気の通しやすさなど、物質の性質の起源を考える。各種の先端的な量子ビームを活用した回折法・散乱法・吸収法によって、原子の配列(静的構造)、揺らぎ(動的構造)、構造の歪みなどを解析する方法を示す。さらに、量子ビームを用いた高温高压特殊環境の生成およびその場状態計測の手法も示す。機械材料や、自然界にある結晶、および不規則系物質についての各種の解析の結果とその意義を説明する。</p>					
<b>[Course objectives]</b>					
物質に対する量子ビームの散乱・回折の基本原則を学び、物質中の原子の配列や揺らぎと、そこから導かれる物質の性質との関連を理解する。					
<b>[Course schedule and contents]</b>					
1.量子ビーム(X線、中性子線、電子線、高強度レーザー)の性質と特徴 2.結晶の対称性と群論 3.結晶の構造解析 4.不規則系物質の構造解析 5.太陽系、惑星、地球の結晶(鉱物、氷)と不規則系物質(マグマ、水) 6.量子ビームを用いた特殊環境の生成および計測の方法 7.日本ならびに世界の量子ビーム施設における物質解析の例					
<b>[Course requirements]</b>					
固体物理学					
<b>[Evaluation methods and policy]</b>					
レポートを提出してもらい、講義内容の理解度を問う。					
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Continue to 量子ビーム物質解析学(2)					



## 量子ビーム物質解析学(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

G．バーンズ 『結晶としての固体（バーンズ固体物理学１）』（東海大学出版会）（ １０７ページ、１９８９年）

G．バーンズ 『固体論の基礎（バーンズ固体物理学２）』（東海大学出版会）（ ９９ページ、１９８９年）

### [Study outside of class (preparation and review)]

授業中に指示する。

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG05 7B631 LB71			
<b>Course title (and course title in English)</b>	高エネルギー材料工学 High Energy Radiation Effects in Solid		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science Associate Professor,JIYO GIYUU Institute for Integrated Radiation and Nuclear Science Professor,KINOMURA ATSUSHI Institute for Integrated Radiation and Nuclear Science Assistant Professor,YABUUCHI ATSUSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Selection, fabrication and deterioration of materials are important factors for mechanical system design. It is necessary to understand conditions under which selected materials are actually used. In particular, special design policies are required for the materials used under irradiation of high-energy particles and radiation. On the other hand, it is possible to intentionally make use of property changes of materials by high-energy particle irradiation.</p> <p>Irradiation of high-energy particles such as accelerated neutrons, ions and electrons deposits very high energies at local regions. Such irradiated regions undergo extreme conditions which cannot be realized by other methods. As a result, the irradiation leads to significant structural and stoichiometric changes in materials. This lecture gives general description of materials irradiation effects, irradiation effects on materials related to nuclear power plants, and academic/industrial applications of materials fabrication/analysis by using high-energy particles.</p>					
<b>[Course objectives]</b>					
To understand reactions and property changes of materials under radiation and high-energy particle irradiation.					
<b>[Course schedule and contents]</b>					
,15times,(1) Introduction (2) Scattering of high-energy particles with atoms in solids (3) Displacement of atoms in solids by high-energy particles (4) Motion and behaviors of point defects (5) Rate equation of point defects and secondary-defect formation (6) The influence of irradiation on material properties (7) Activation of materials (8) High-energy particle sources (9) Ion beam fabrication (10) Ion beam analysis (11) Electron beam applications (12) Materials irradiation studies (13) Neutron irradiation effects and nuclear materials (14) Positron analysis					
<b>[Course requirements]</b>					
Basic knowledge on materials engineering and mechanics					
<b>[Evaluation methods and policy]</b>					
Grading is based on small quizzes and report submission (if necessary) on the lecture.					
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Continue to 高エネルギー材料工学(2)					

## 高エネルギー材料工学(2)

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### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG05 6G017 LB71			
<b>Course title (and course title in English)</b>	破壊力学 Fracture Mechanics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Associate Professor,NISHIKAWA MASAOKI Graduate School of Engineering Professor,SHIMADA TAKAHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
破壊力学の基礎について輪読を通じて学習する。					
弾性問題の解法、応力関数によるき裂の弾性解、き裂先端近傍の応力場、応力拡大係数、エネルギー解放率、J積分について学ぶ。その後、非線形破壊力学の基礎へ展開する。さらに、疲労や環境等の種々の条件におけるき裂進展挙動への破壊力学の適用に関して理解を深める。					
<b>[Course objectives]</b>					
破壊力学の基礎知識を習得し、特異応力場が存在する場合の材料強度評価について学術的な議論が行えることを目指す。					
<b>[Course schedule and contents]</b>					
破壊力学入門：破壊に関する概論、1回 き裂の弾性解析：弾性力学の基礎、き裂先端近傍の応力場、2回 線形破壊力学：応力拡大係数、エネルギー解放率、小規模降伏、き裂先端の塑性域、2回 非線形破壊力学：弾塑性破壊力学、HRR特異場とJ積分、クリープき裂の特異場、き裂開口変位、2回 破壊力学の数値解析法、1回 破壊じん性、2回 疲労き裂進展への破壊力学の適用、2回 クリープおよび高温疲労き裂進展への破壊力学の適用、1回 環境下き裂進展への破壊力学の適用、1回 学習到達度の確認とフィードバック、1回					
<b>[Course requirements]</b>					
材料力学と線形弾性力学についての知識があることが望ましい。					
<b>[Evaluation methods and policy]</b>					
分担部分の発表、議論への参加状況および出席状況により評価を行う。					
Continue to 破壊力学(2)					

## 破壊力学(2)

### [Textbooks]

中井善一、久保司郎著 『破壊力学』（朝倉書店）

### [References, etc.]

（ Reference books ）

### [Study outside of class (preparation and review)]

分担部分の発表資料作成、教科書の予習復習および関連文献調査など

### （ Other information (office hours, etc.) ）

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG05 7G021 LB71			
<b>Course title (and course title in English)</b>	光物理学 Engineering Optics and Spectroscopy		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,HASUO MASAHIRO Graduate School of Engineering Associate Professor,SHIKAMA TAIICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Optics are widely used in many areas of modern science and technology. Students will learn the physical properties of light and light-matter interactions, and their applications. Topics such as light propagation in dielectric media, crystal optics, quantum optics, and lasers will be explored. Interactions of light with atoms, molecules and solids as examples will be also explored with introduction of the fundamentals of spectroscopy and their applications.					
<b>[Course objectives]</b>					
Understand the principles of optical engineering and spectroscopy. Develop application abilities based on the principle understanding.					
<b>[Course schedule and contents]</b>					
Dispersion of light,6times,propagation of light in dielectric media (Lorentz model), crystal optics, nonlinear optics Quantum optics,1time,quantum theory of light, principles of lasers Light-matter interactions,5times,light-induced transition, quantum states of atoms, molecules, and solids, and rules governing the transitions (selection rules) Selection rules and group theory,2times,introduction to group theory and its application to the selection rules Confirmation of the achievement,1time,					
<b>[Course requirements]</b>					
Undergraduate-level electromagnetism and quantum mechanics.					
<b>[Evaluation methods and policy]</b>					
Grade evaluation will be based on report examination.					
<b>[Textbooks]</b>					
Recommended books will be discussed in class.					
<b>[References, etc.]</b>					
( Reference books ) Lecture notes will be distributed.					
<b>[Study outside of class (preparation and review)]</b>					
Preparation and review will be discussed in class.					
( Other information (office hours, etc.) )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG05 6G025 LB71				
<b>Course title (and course title in English)</b>	メカ機能デバイス工学 Mechanical Functional Device Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KOMORI MASAHARU Graduate School of Engineering Professor, HIRAYAMA TOMOKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
For any machines, prime movers and powertrains are necessary to realize the required functions. In automobiles, an engine is the prime mover and a transmission, a clutch, and a shaft are parts of the powertrain. In machine tools, a motor is used as the prime mover and the powertrain uses feed screws. In this lecture, the prime mover is taken up. Types, characteristics, principles, advantages and disadvantages of the prime mover are explained. Students also learn the basics of tribology, surfaces and contacts, friction, wear, lubrication theory, dynamic guide, hydrostatic guide, rolling guide, oil seal, mechanical seal, packing.					
<b>[Course objectives]</b>					
Understand the principles and basic characteristics of the prime movers and tribology taken up in the lecture.					
<b>[Course schedule and contents]</b>					
Outline, 1time, Composition of mechanical device, examples of prime movers, working parts, and powertrains, examples of actuators Electromagnetic force, 2times, Principle used for actuators, type of electromagnetic motor, principle and characteristics of synchronous motor, generating method of rotating magnetic field, induction motor, reluctance motor, DC motor, stepping motor Electrostatic force, piezoelectric, 2times, Usage of electrostatic force as actuator, explanation of principle and characteristics, piezoelectric effect, characteristics of piezoelectric effect, piezoelectric material, polarization, displacement and force, hysteresis, type and basic structure, application Fluid pressure, ultrasonic, shape memory alloy, 2times, Fluid pressure actuator, ultrasonic motor, shape memory effect, shape recovery Tribology, 5times, foundation of tribology, surface and contact, friction, wear, lubrication theory Guide, 1time, dynamic guide, hydrostatic guide, rolling guide Seal, 1time, oil seal, mechanical seal, packing Feedback class, 1time, Answer questions					
<b>[Course requirements]</b>					
Nothing.					
<b>[Evaluation methods and policy]</b>					
Evaluate comprehensively by participation in class, tests, reports, etc.					
<b>[Textbooks]</b>					
Instruct as necessary.					
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Continue to メカ機能デバイス工学(2)					

## メカ機能デバイス工学(2)

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### [References, etc.]

#### ( Reference books )

Instruct as necessary.

### [Study outside of class (preparation and review)]

Review the handouts

### ( Other information (office hours, etc.) )

Schedule of lecture may be changed according to circumstances. Supplement in English as necessary.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG34 6G031 SB71				
<b>Course title (and course title in English)</b>	機械理工学セミナー A Seminar on Mechanical Engineering and Science A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,5times, ,5times, ,5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG34 6G032 SB71					
<b>Course title (and course title in English)</b>	機械理工学セミナーB Seminar on Mechanical Engineering and Science B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,5times, ,5times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG05 6G036 SB71					
<b>Course title (and course title in English)</b>	機械理工学基礎セミナーA Basic Seminar on Mechanical Engineering and Science A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG05 6G037 SB71					
<b>Course title (and course title in English)</b>	機械理工学基礎セミナーB Basic Seminar on Mechanical Engineering and Science B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG05 6G039 LB71			
<b>Course title (and course title in English)</b>	熱物質移動論 Transport Phenomena		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKABE KAZUYOSHI Graduate School of Engineering Associate Professor, TATSUMI KAZUYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>The important learning objective of this class is to understand the fundamental mechanisms of momentum, heat, and mass transfer phenomena, the knowledge of which will be markedly required for the thermal energy control technologies to further practice conservations of natural resources and energies for sustainable development. Heat and mass transfer processes consisting of conduction and forced/natural convection will be highlighted in detail, referring to the similarity characteristics of flow velocity, fluid temperature, and species concentration. Some topics on Reynolds stress, turbulent heat flux, and phase change will be introduced, expanding to their numerical models, together with some recent trends of high-tech heat and energy devices.</p>					
<b>[Course objectives]</b>					
<p>To understand the basic knowledge of velocity-temperature-concentration fields under the thermo-fluid conditions of conduction, forced convection, and natural (or free) convection. Also, to acquire these knowledge to make a suitable thermal engineering analysis when you encounter heat and mass transfer problems in the future.</p>					
<b>[Course schedule and contents]</b>					
1. Introduction and Surrounding Examples of Transport Phenomena 2. - 4. Governing Equations and Non-Dimensional Parameters 5. - 7. Boundary Layer Flows 8. - 9. External and Internal Flows 10. - 11. Turbulent Phenomena 12. - 14. Topics of Flow and Heat Transfer Mechanism 15. Final Examination / Learning Achievement Evaluation 16. Feedback					
<b>[Course requirements]</b>					
<p>It'll be desirable to take lectures of core subjects 'Introduction to Advanced Fluid Dynamics' and 'Thermal Science and Engineering.'</p>					
Continue to 熱物質移動論(2)					

## 熱物質移動論(2)

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### [Evaluation methods and policy]

Evaluation will be based on active participation, assignments, and written examination.

### [Textbooks]

Textbooks are not specified. Printed materials for the lecture will be distributed properly.

### [References, etc.]

#### ( Reference books )

For example, "Transport Phenomena (Bird, R.B. et al.)", etc.

### [Study outside of class (preparation and review)]

Preparation and review are required using the printed materials distributed in the class.

### ( Other information (office hours, etc.) )

The thema order of the lecture can be changed, depending on the classwork progressing.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG05 6G051 EB71					
<b>Course title (and course title in English)</b>	機械理工学特別実験及び演習第一 Experiments on Mechanical Engineering and Science, Adv. I			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, IWAI HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,9times, ,10times, ,10times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG05 6G053 EB71					
<b>Course title (and course title in English)</b>	機械理工学特別実験及び演習第二 Experiments on Mechanical Engineering and Science, Adv. II			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, IWAI HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,9times, ,10times, ,10times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG05 6G403 LB71				
<b>Course title (and course title in English)</b>	最適システム設計論 Optimum System Design Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,NISHIWAKI SHINJI Graduate School of Engineering Associate Professor,IZUI KAZUHIRO Graduate School of Engineering Senior Lecturer,Lim, Sunghoon	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,4times, ,2times, ,5times, ,2times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG05 7Q610 LB71			
<b>Course title (and course title in English)</b>	原子系の動力学セミナー Seminar: Dynamics of Atomic Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,MATSUMOTO MITSUHIRO Graduate School of Engineering Professor,INOUE YASUHIRO Graduate School of Engineering Professor,SHIMADA TAKAHIRO Graduate School of Engineering Associate Professor,NISHIKAWA MASAOKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Particle simulations are a tool of analyzing microscopic phenomena, and widely used in various fields of science and engineering. After providing the basics of particle simulation methods through lectures and exercises, we show various practical applications in thermofluids, solid materials, biophysics, and quantum systems.					
<b>[Course objectives]</b>					
<ul style="list-style-type: none"> <li>- Understanding the basics of particle simulations</li> <li>- Mastering data analysis techniques</li> </ul>					
<b>[Course schedule and contents]</b>					
<p>Basics of MD simulations (M.Matsumoto),6times,- Numerical simulation of equations of motion - Model potentials - Data analysis - Equilibrium vs. non-equilibrium</p> <p>Application: Thermofluidal systems (M. Matsumoto),2times,- Lennard-Jones fluids - Interface, phase change, energy transport, etc.</p> <p>Application: Polymeric materials (Nishikawa),2times,- Fundamentals on mechanical (viscoelastic) properties of polymer materials - Application of molecular dynamics method of polymer materials</p> <p>Application: Biosystems (Inoue),1time,- MD simulation of biomolecular systems - Recent examples</p> <p>Application: Solid systems (R. Matsumoto),1time,- Deformation and destruction - Alternative methods</p> <p>Application: Quantum systems (Shimada),2times,- First principle MD - Mechanical and electronic properties on nanoscale</p> <p>Check and Feedback,1time,</p>					
<b>[Course requirements]</b>					
Elementary Level of Analytical mechanics, Quantum mechanics, Material science, Thermodynamics, Statistical physics, Numerical analysis					
<b>[Evaluation methods and policy]</b>					
Reports, presentation/discussion					
<b>[Textbooks]</b>					
Not used					
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Continue to 原子系の動力学セミナー(2)					

## 原子系の動力学セミナー(2)

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### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Exercises with simple C programs are given, with which you will understand the concepts deeply.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG05 6Q807 LB71				
<b>Course title (and course title in English)</b>	デザインシステム学 Theory for Design Systems Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SAWARAGI TETSUO Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The lecture focuses on the human design activity; designing artifacts (things, events and systems) based on human intuitions, and designing human-machine systems in which the relations between human and objects are of importance.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,2times, ,3times, ,3times, ,2times, ,2times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG34 7V012 SJ71					
<b>Course title (and course title in English)</b>	機械理工学特別演習 A Advanced Exercise in Mechanical Engineering and ScienceA		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG34 7V013 SJ71					
<b>Course title (and course title in English)</b>	機械理工学特別演習 B Advanced Exercise in Mechanical Engineering and ScienceB		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG34 7V014 SJ71					
<b>Course title (and course title in English)</b>	機械理工学特別演習 C Advanced Exercise in Mechanical Engineering and ScienceC		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG34 7V015 SJ71					
<b>Course title (and course title in English)</b>	機械理工学特別演習 D Advanced Exercise in Mechanical Engineering and ScienceD		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG34 7V016 SJ71					
<b>Course title (and course title in English)</b>	機械理工学特別演習 E Advanced Exercise in Mechanical Engineering and ScienceE		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG34 7V017 SJ71					
<b>Course title (and course title in English)</b>	機械理工学特別演習 F Advanced Exercise in Mechanical Engineering and ScienceF		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,IWAI HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG06 7B617 LB71				
<b>Course title (and course title in English)</b>	量子分子物理学特論 Quantum Theory of Molecular Physics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, SENAMI MASATO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Basics for the application of quantum theory to molecular physics and recent progress. Main topics: analytic mechanics, relativistic quantum mechanics, quantum field theory, and path integral.					
<b>[Course objectives]</b>					
To understand fundamental physics to apply quantum mechanics to phenomena of atoms or molecules.					
<b>[Course schedule and contents]</b>					
1. Analytic mechanics and symmetry in physics, 1 times, Principle of least action, Equation of motion, Hamiltonian mechanics, Symmetry and conservation law in physics, Noether's theorem, Group theory 2. Classical relativistic theory, 2 times, Invariance of the speed of light, Lorentz transformation, Relativistic form of electromagnetism, Four component vector potential 3. Relativistic quantum mechanics, 4-7 times, Relativistic equation of motion, Nonrelativistic limit of Dirac equation, Covariance of Dirac equation, Plane wave solution for Dirac equation and negative energy, Hole theory and problem, Tani-Foldy-Wouthuysen transformation, Hydrogen-like atom, Helicity and Chirality 4. A primer of quantum field theory, 2-4 times, Field operator, Charge conjugation, Noether's theorem, Gauge transformation and gauge symmetry, Application of quantum field theory to theoretical study of molecules and condensed matter 5. Electronic Structure Computation, 1-2 times, Time evolution and propagator, Transition amplitude and path integral, Aharonov-Bohm effect, Path integral in quantum field theory Confirmation, 1 time,					
<b>[Course requirements]</b>					
Quantum Mechanics					
<b>[Evaluation methods and policy]</b>					
Evaluation will be based on assignments (four - six times, 100 points).					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
J. D. Bjorken, S. D. Drell, Relativistic Quantum Mechanics					
----- Continue to 量子分子物理学特論(2) -----					

## 量子分子物理学特論(2)

J. J. Sakurai, Modern Quantum Mechanics, and Advanced Quantum Mechanics  
R. P. Feynmann, A. R. Hibbs, Quantum Mechanics and Path Integrals

### [Study outside of class (preparation and review)]

Review lecture notes.

### ( Other information (office hours, etc.) )

If English support is required, please contact the instructor by email. Then words written on a blackboard and some supplementary documents are provided in English.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG06 5G204 LJ51				
<b>Course title (and course title in English)</b>	マイクロファブリケーション Microfabrication		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUCHIYA TOSHIYUKI Graduate School of Engineering Assistant Professor, URABE KEIICHIRO Graduate School of Engineering Associate Professor, HIROTANI JUN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Micro/nano fabrication processes and materials used to realize micro/nano systems are described. Topics will be photolithography, dry-etching, thin-film deposition, which includes bulk micro machining, surface micro machining and further advanced polymer processing.					
<b>[Course objectives]</b>					
To obtain fundamental knowledge about design and fabrication of micro/nano systems and to be familiar with recent fabrication technologies and micro/nano systems.					
<b>[Course schedule and contents]</b>					
<p>Week 1: introduction</p> <ul style="list-style-type: none"> <li>• Microfabrication and devices</li> </ul> <p>Week 2 to 4: Advanced semiconductor device fine processing technology</p> <ul style="list-style-type: none"> <li>• Front-end process flow</li> <li>• Photolithography basics and recent topics</li> <li>• Plasma etching</li> </ul> <p>Week 5 to 7: Basics of semiconductor physics and device application</p> <ul style="list-style-type: none"> <li>• Basics of semiconductor physics</li> <li>• PN junction, metal-semiconductor junction</li> <li>• Nanocarbon material and device</li> </ul> <p>Week 8 to 9: Silicon and micromaterials</p> <ul style="list-style-type: none"> <li>• Mechanical properties of silicon</li> <li>• Evaluation of mechanical properties of micro-scale materials</li> </ul> <p>Week 10 to 11: Silicon micromachining</p> <ul style="list-style-type: none"> <li>• Processing process based on semiconductor fine processing technology</li> <li>• Bulk and surface micromachining</li> </ul> <p>Week 12 to 14: Basics of Applied Devices</p> <ul style="list-style-type: none"> <li>• Electrostatic transducers and its application</li> <li>• Piezoresistive effect and its application</li> <li>• Sensors / actuators</li> </ul> <p>Week 15: feedback on evaluations such as reports</p>					
Continue to マイクロファブリケーション (2)					

## マイクロファブリケーション (2)

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### [Course requirements]

None

### [Evaluation methods and policy]

Evaluated by homework. All report must be submitted to obtain credits.

### [Textbooks]

Not used

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Follow reports and other instructions from each person in charge.

### ( Other information (office hours, etc.) )

Students unfamiliar with Japanese may enroll in this course. Their lessons will be supplemented with presentation slides, homework, and other additional course materials in English.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG06 5G206 LE51				
<b>Course title (and course title in English)</b>	マイクロ・バイオシステム Micro/bio system		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI Institute for Advanced Study Associate Professor, KAMEI KENICHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>Micro/nano systems are based on micro/nano fabrications and encompasses not only individual phenomena in physics and chemistry but also the integrated phenomena observed in these fields. Moreover, recently the integrated systems utilizing biomaterials (cells, tissues, organs etc.) are being developed to realize micro/nano bio systems with potential applications in medicine, drug development, and basic studies in life sciences. In this course, we focus on the difference of physical and chemical phenomena between micro/nano and micro scales. Micro/nano fabrications for micro/nano biosystems, biomolecular sensing, DNA/protein/cell manipulation and their integration to realize complex integrated biosystems such as BioMEMS and MicroTAS will be introduced.</p>					
<b>[Course objectives]</b>					
<p>To understand the fundamentals of fabrication technologies for BioMEMS and MicroTAS.          To understand the roles of micro/nano fabrications in life sciences.          To understand sensing and actuation mechanisms at micro/nano scales.</p>					
<b>[Course schedule and contents]</b>					
<p>The specific course goals are as outlined below.          Week 1-3: Introduction for micro/bio systems - Introduce the history and fundamentals of BioMEMS and MicroTAS based on micro/nano fabrications.          Week 4-7: Soft micro machining - In micro/bio systems, biomaterials and organic/inorganic polymers are used as structural materials. Fabrication of these materials by the so-called “ soft micromachining ”, and their applications will be described.          Week 8-9: Micro/nano scale bio materials - Integration of functional biomolecules, cells and polymer materials to realize micro/bio systems are described.          Week 10-11: Micro Total Analysis Systems (MicroTAS) - On-chip chemical analysis systems and bio sensing devices are described.          Week 12-15: Nano bio systems - Integration of micro/nano fabrications and biomaterials for application to biomedical and regenerative medicine are described.</p>					
<b>[Course requirements]</b>					
<p>The course is based on micro/nano fabrication described in Microfabrication (10G203). It is highly recommended to register for the course as well.</p>					
<p style="text-align: right;">Continue to マイクロ・バイオシステム (2)</p>					

## マイクロ・バイオシステム (2)

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### [Evaluation methods and policy]

Evaluation will be based on assignments and class performance. Evaluation for class performance includes attendance and reports given at class.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Preparation and review of course materials are necessary.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>		G-ENG06 6G211 LB71			
<b>Course title (and course title in English)</b>	物性物理学 1 Solid State Physics 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SUZUKI MOTOFUMI Graduate School of Engineering Associate Professor, NAKAJIMA KAORU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Students will learn the basics of solid-state physics through turn-based lecturing and reading of Chapters 2-6 of C. Kittel's "Introduction to Solid State Physics." Specifically, the diffraction of waves by crystals will be discussed, followed by the concept of inverse lattices. The course also covers the forces acting between the atoms constituting crystals, and discusses the elastic properties of crystals. Additionally, students will learn the properties of phonons that quantize the elastic oscillation of crystals and understand the thermal properties of crystals. Based on the free electron model, the electrical and thermal properties of metals will also be covered.					
<b>[Course objectives]</b>					
Understanding the various underlying concepts in solid-state physics, such as inverse lattices, phonons, and free electrons					
<b>[Course schedule and contents]</b>					
<p>Lectures 1-2 Diffraction of Waves by Crystals Using X-rays as an example, students learn the basics of the phenomenon of diffraction of waves caused by crystals.</p> <p>Lectures 3-4 Reciprocal Lattice Vector Students learn to express conditions of diffraction using reciprocal lattice vectors and understand Ewald Construction. They will also learn about structural factors.</p> <p>Lectures 5-6 Crystal Bonds Students learn about the basic types of bonds that form crystals, i.e., van der Waals interaction, Ionic bonds, Metallic bonds, Covalent bonds, and Hydrogen bonds.</p> <p>Lecture 7 Elastic Constant of Crystals After learning the relationship between crystal symmetry and elastic constants, we study the behavior of elastic waves in cubic crystals.</p> <p>Lectures 8-9 Elastic Oscillation in Crystals Students learn vibrations of crystals with a monatomic basis and understand the concept of phonons. It is extended to the cases for crystals with two or more atoms per primitive basis.</p> <p>Lecture 10 Phonon Heat Capacity After studying the statistical mechanics of phonons, we introduce the Debye model for the density of states of phonons to estimate phonon contribution to the heat capacity.</p>					
----- Continue to 物性物理学 1 (2) -----					

## 物性物理学 1 (2)

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### Lecture 11 Phonon Thermal Conductivity

Students will study the thermal conduction by phonons and understand the contribution of the Umklapp process to the thermal resistivity of phonon gas.

### Lecture 12 Free-electron Model of Metals

Under the free-electron model of metals, students learn the statistical mechanics of electron gases.

### Lecture 13 Heat Capacity of Electron Gases

Based on the statistical mechanics of electron gas, we will discuss the heat capacity of electron gases.

### Lecture 14 Electrical and Thermal Conductivity of Electron Gas

Students will learn the phenomenology of electrical and thermal conductivity of electron gases. In addition, we discuss the Hall effect.

### Lecture 15 Feedback

Check the course's degree of achievement against the final goal. Review as needed.

## [Course requirements]

Students should have a rudimentary understanding of quantum mechanics.

## [Evaluation methods and policy]

The evaluation will be conducted based on participation in discussions.

## [Textbooks]

C. Kittel 『Introduction to Solid State Physics』 ( Wiley ) ISBN:978-0471415268  
チャールズ キッテル 『キッテル 固体物理学入門 第8版』 ( 丸善 ) ISBN:978-4621076569  
the original or translated version, either is acceptable.

## [References, etc.]

( Reference books )

## [Study outside of class (preparation and review)]

Preparation and review of the textbook are essential in order to advance the turn-based lecturing style of class.

## ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG06 5G214 LJ71				
<b>Course title (and course title in English)</b>	精密計測加工学 Precision Measurement and Machining		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUBARA ATSUSHI Graduate School of Engineering Program-Specific Associate Professor, BEAUCAMP, Anthony Tadeus Herve	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course gives the principles of precision measurement and machining process for the meso-micro-nano metric fabrication. The optical measurement technologies (e.g. laser interferometer, optical encoders) and cutting technologies (e.g. cutting mechanics, tool, machine) are shown.					
<b>[Course objectives]</b>					
Understand the basic principles of precision measurement and machining associated with the applications					
<b>[Course schedule and contents]</b>					
Basics of measurement and machining, 1time, Concept of accuracy, precision, Relation of measurement, machining, and control Basics of precision measurement, 2times, Optical measurement, 4times, , 3times, , 1time, , 2times, , 2times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Small exams in the term and the final exam					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG35 6G216 SB51				
<b>Course title (and course title in English)</b>	マイクロエンジニアリングセミナー A Seminar on Micro Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,-times, ,-times, ,-times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG35 6G217 SB51					
<b>Course title (and course title in English)</b>	マイクロエンジニアリングセミナー B Seminar on Micro Engineering B			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,-times, ,-times, ,-times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG06 7G223 SB51				
<b>Course title (and course title in English)</b>	マイクロエンジニアリング基礎セミナーA Basic Seminar on Micro Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,10times, ,5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG06 7G224 SB51					
<b>Course title (and course title in English)</b>	マイクロエンジニアリング基礎セミナーB Basic Seminar on Micro Engineering B			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG06 7G226 EB51				
<b>Course title (and course title in English)</b>	マイクロエンジニアリング特別実験及び演習第一 Experiments on Micro Engineering, Adv. I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
, 1 times, , 9times, , 10times, , 10times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG06 7G228 EB51					
<b>Course title (and course title in English)</b>	マイクロエンジニアリング特別実験及び演習第二 Experiments on Micro Engineering, Adv. II			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,9times, ,10times, ,10times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG06 6V201 LB51			
<b>Course title (and course title in English)</b>	微小電気機械システム創製学 Micro Electro Mechanical System Creation		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,YOKOKAWA RYUUJI Graduate School of Engineering Senior Lecturer,BANERJEE, Amit Graduate School of Engineering Associate Professor,HIROTANI JUN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a joint lecture with Hong Kong University of Science and Technology (HKUST) and Tsing-Hua University. A team consists of two students from each University work together to fulfill the assignment (design a microsystem) through paper survey, analysis, design, and presentation. A student can acquire not only the basic knowledge of a microsystem, but also comprehensive ability of English such as technical knowledge in English, skill for team work, and communication.					
<b>[Course objectives]</b>					
Acquire the knowledge and skill to design and analyze a microsystem.					
<b>[Course schedule and contents]</b>					
<p>* Tutorial on microsystem CAD software, 2times Master CAD program for microsystem design and analysis which will be utilized to accomplish an assignment.</p> <p>* Lecture and Task Introduction, 2times Learn basic knowledge necessary to design a microsystem/MEMS(Micro Electromechanical Systems) utilizing microfabrication technology.</p> <p>* Design and analysis work, 4times Analyze and design a microsystem by communicating with a team member of HKUST.</p> <p>* Presentation I, 2times The designed device and its analyzed results is presented in detail by team in English.</p> <p>* Evaluation of device, 3times Evaluate the fabricated microsystem.</p> <p>* Presentation II, 2times The measured results and comparison between the analyzed results of the fabricated microsystem is presented by team in English.</p>					
<b>[Course requirements]</b>					
Students are required to take the 10G204 course Microfabrication provided in 1st term.					
<b>[Evaluation methods and policy]</b>					
<b>【Evaluation method】</b> Evaluation will be based on presentations (60 points) and the end of the term assignments (40 points).					
<b>【Evaluation standard】</b> _ _ _ _ _					
Continue to 微小電気機械システム創製学(2)					

## 微小電気機械システム創製学(2)

Presentations are evaluated with not only design, simulation and measurement results of device, but also collaboration among their team members.

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

The class is a problem-solving class. Learning and work outside the lecture hours are indispensable.

### ( Other information (office hours, etc.) )

For video conference for team presentation is going to be held 4th and 5th on Friday. Those who want to take this course have to take training course for CAD in advance. Those students who want to take this course has to contact Prof. Tsuchiya ([tutti@me.kyoto-u.ac.jp](mailto:tutti@me.kyoto-u.ac.jp)) by the end of 1st term.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG06 7V205 LB71			
<b>Course title (and course title in English)</b>	物性物理学 2 Solid State Physics 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SUZUKI MOTOFUMI Graduate School of Engineering Associate Professor, NAKAJIMA KAORU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Students will learn the basics of solid-state physics through turn-based lecturing and reading of chapters from Ch. 7 onward of C. Kittel's "Introduction to Solid State Physics." Specifically, the state of electrons inside crystals will be discussed based on Bloch's theorem, followed by understanding the band structure. Based on this, the course covers the electrical properties of semiconductors and concepts such as holes and effective mass. We will also discuss the Fermi surface of metals and understand their primary physical properties. In addition, we will learn experimental facts, phenomenological theories, and BCS theory on superconductivity.					
<b>[Course objectives]</b>					
Learning the basics of metal and semiconductor physics					
<b>[Course schedule and contents]</b>					
Lecture 1 Nearly Free Electron Model Students will learn the Nearly Free Electron Model.					
Lecture 2 Bloch's Theorem Students will learn Bloch's theorem and understand the energy gap that occurs using the Kronig-Penney model.					
Lectures 3-4 Energy Bands The energy bands of crystals are considered using a two-wave approximation based on Bloch's theorem.					
Lectures 5-8 Semiconductors Based on the energy band structure of semiconductors, students learn the concept of holes, and then study the concept of effective mass by considering the equations of motion that electrons and holes follow in semiconductors. Next, the carrier concentration is determined based on the statistical mechanics of electrons and holes in the semiconductor. In addition, students learn about mobility, conduction of impurity, thermoelectric effects, and motion of electrons in superlattices.					
Lectures 9-11 Metals After learning that many of the electrical properties of metals are determined by the Fermi surface, students learn how to construct the Fermi surface for nearly free electrons. In addition, students learn how to calculate energy bands using tight-binding approximation, the Wigner-Seitz method, the pseudopotential method, etc. We also consider the quantization of electron orbits in magnetic fields and learn how to examine the Fermi surface by the de Haas-van Alphen effect.					
Lectures 12-14 Superconductivity					
----- Continue to 物性物理学 2 (2) -----					

## 物性物理学 2 (2)

Students learn the experimental facts of the phenomenon of superconducting, consider the theory of superconductivity, and study the London equation. Based on this, they discuss the London penetration depth and coherence length. In addition, we give a brief explanation of BCS theory and learn about the quantization of magnetic flux and the Josephson effect.

### Lecture 15 Feedback

Check the course's degree of achievement against the final goal. Review as needed.

### [Course requirements]

Students should have an understanding of Chapters 1-6 of C. Kittel's "Introduction to Solid State Physics."

### [Evaluation methods and policy]

The evaluation will be conducted based on participation in discussions.

### [Textbooks]

C. Kittel 『Introduction to Solid State Physics』 ( Wiley ) ISBN:978-0471415268  
チャールズ キッテル 『キッテル 固体物理学入門 第8版』 ( 丸善 ) ISBN:978-4621076569  
the original or translated version, either is acceptable.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Preparation and review are essential given the turn-based lecturing style of class.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG35 7V210 SJ71					
<b>Course title (and course title in English)</b>	マイクロエンジニアリング特別演習 A Advanced Exercise in Micro Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG35 7V211 SJ71					
<b>Course title (and course title in English)</b>	マイクロエンジニアリング特別演習 B Advanced Exercise in Micro Engineering B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG35 7V212 SJ71				
<b>Course title (and course title in English)</b>	マイクロエンジニアリング特別演習 C Advanced Exercise in Micro Engineering C		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,10times, ,5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG35 7V213 SJ71					
<b>Course title (and course title in English)</b>	マイクロエンジニアリング特別演習 D Advanced Exercise in Micro Engineering D		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG35 7V214 SJ71				
<b>Course title (and course title in English)</b>	マイクロエンジニアリング特別演習 E Advanced Exercise in Micro Engineering E		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,10times, ,5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG35 7V215 SJ71					
<b>Course title (and course title in English)</b>	マイクロエンジニアリング特別演習 F Advanced Exercise in Micro Engineering F		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,10times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG07 6C430 LJ77				
<b>Course title (and course title in English)</b>	航空宇宙機力学特論 Advanced Flight Dynamics of Aerospace Vehicle		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,AOI SHINYA Graduate School of Engineering Professor,SENDA KEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Flight Dynamics and Control of Aerospace Vehicles including Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechanics, etc.					
<b>[Course objectives]</b>					
To understand analytical mechanics through flight dynamics of aerospace vehicles: Basic items of Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechanics, etc.					
<b>[Course schedule and contents]</b>					
Analytical Mechanics,7times,1. Newton equations, 2. Lagrange equations, 3. Hamilton equations Orbital Mechanics,4times,1. Motions in central force field, 2. Conservation law, 3. Orbit transition Attitude Dynamics and Control,4times,1. Kinematics of rotation, 2. Attitude mechanics, 3. Stability analysis of equilibrium points, 4. Attitude Control					
<b>[Course requirements]</b>					
Foundation of mechanics and mathematics, Flight Dynamics of Aerospace Vehicle (Undergraduate)					
<b>[Evaluation methods and policy]</b>					
Evaluation depends on marks of examination (approximately 80%) and exercises (approximately 20%). Both marks should be 60% or better.					
<b>[Textbooks]</b>					
Instructed during class					
<b>[References, etc.]</b>					
( Reference books )					
L. D. Landau and E. M. Lifshitz 『Mechanics, Volume 1 (Course of Theoretical Physics) 』 ( Elsevier ) ISBN:0750628960					
Herbert Goldstein 『Classical Mechanics 』 ( Addison-Wesley ) ISBN:0201657023 ( international ed. ISBN 0321188977 )					
Toda 『Introductory course of physics 1 Mechanics 』 ( Iwanami Shoten ) ISBN:4000076418 ( in Japanese )					
Koide 『Introductory course of physics 2 Analytical Mechanics 』 ( Iwanami Shoten ) ISBN:4000076426 ( in Japanese )					
Wadachi 『Introductory course of physics 10 Mathematics for physics 』 ( Iwanami Shoten ) ISBN:_____					
Continue to 航空宇宙機力学特論(2)					

## 航空宇宙機力学特論(2)

4000076507 ( in Japanese )

### [Study outside of class (preparation and review)]

Learn the basic mechanics and mathematics for analytical mechanics.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG07 6G230 LJ77			
<b>Course title (and course title in English)</b>	動的固体力学 Dynamics of Solids and Structures		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, BIWA SHIROU Graduate School of Engineering Assistant Professor, ISHII YOSUKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Fundamental principles for dynamic deformations of solids and structures are examined. In particular, basic characteristics of elastic wave motion in solid media are emphasized. Dynamic responses and fracture behavior of materials and structures under impact loading are also considered.					
<b>[Course objectives]</b>					
This course aims to establish the understanding of basic characteristics of dynamic deformations, elastic waves and fracture in solid media, as well as to learn about technological applications of elastic waves in a variety of fields. Particular emphasis is put on the mathematical aspects of the physical phenomena involved.					
<b>[Course schedule and contents]</b>					
Week 1: Fundamentals of elastodynamics (Expressions of stress and strain; Conservation laws; Hooke's law; Principle of virtual work; Hamilton's principle and its applications)					
Week 2: Basics of wave propagation (1) (One-dimensional wave equation; D'Alembert's solution; Harmonic waves)					
Week 3: Basics of wave propagation (2) (Spectral analysis; Waves in structural members; Dispersive waves; Phase and group velocities)					
Week 4: Stress waves in bars (Reflection and transmission at bi-material connection; Reflection at a free end; Stress wave by tensile loading at a bar end; Plastic wave)					
Week 5: Waves in isotropic elastic media (Navier's equations; Longitudinal and transverse waves; Plane elastic waves in isotropic solids)					
Week 6: Waves in anisotropic elastic media (1) (Voigt representation; Plane elastic waves in anisotropic solids; Christoffel's equation; Acoustic tensor)					
Week 7: Waves in anisotropic elastic media (2) (Plane waves in solids with cubic symmetry; Energy flux; Slowness surfaces)					
Week 8: Reflection and transmission (1) (Reflection and transmission of normally incident waves; Snell's law; Mode conversion)					
Week 9: Reflection and transmission (2) (Reflection and refraction of obliquely incident waves; Total reflection)					
Week 10: Guided elastic waves (Bulk waves and guided waves; Rayleigh wave)					
Week 11: Guided elastic waves (Lamb wave; SH plate wave; Love wave; Dispersion and multiple modes)					
Week 12: Dynamic fracture mechanics (1) (Linear fracture mechanics; Stress intensity factor; Energy release rate)					
Week 13: Dynamic fracture mechanics (2) (Stationary cracks under dynamic loading)					
Week 14: Dynamic fracture mechanics (3) (Propagating cracks; Dynamic energy release rate)					
Week 15: Feedback					
-----					
Continue to 動的固体力学(2)					

## 動的固体力学(2)

### [Course requirements]

Basic knowledge of mechanics of materials (solid mechanics, continuum mechanics) is expected.

### [Evaluation methods and policy]

Grading is made based on the final examination (about 70%) and the reports (about 30%). The total score is evaluated between 0 and 100 points (the pass mark is 60).

### [Textbooks]

No textbooks are assigned. Print-outs are handed in when needed.

### [References, etc.]

#### ( Reference books )

No reference books are assigned.

### [Study outside of class (preparation and review)]

Enrolling students are expected to work on the lecture materials and the homework problems.

### ( Other information (office hours, etc.) )

The time units and weights for each item on the above list are subject to possible changes.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG07 6G405 LJ77				
<b>Course title (and course title in English)</b>	推進工学特論 Propulsion Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, ERIGUCHI KOUJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,2times, ,2times, ,4times, ,2times, ,2times, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG07 6G406 LJ77					
<b>Course title (and course title in English)</b>	気体力学特論 Gas Dynamics, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TAKATA SHIGERU Graduate School of Engineering Assistant Professor,HATTORI MASANARI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Mon.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,3times, ,2times, ,4times, ,3times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG07 6G409 LJ77				
<b>Course title (and course title in English)</b>	航空宇宙システム制御工学 Aerospace Systems and Control		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, FUJIMOTO KENJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
We introduce advanced system control theory of modern control based on state equation. In particular, lectures on nonlinear control, optimal control and application to control system design of mechatronics and spacecraft will be given.					
<b>[Course objectives]</b>					
To acquire modern control theory and nonlinear control useful for mechatronics and aerospace engineering.					
<b>[Course schedule and contents]</b>					
<p>Three lectures on aerospace and control:</p> <p>1. State-space equations, 2. Basics of variational methods, 3 Integrability and Forbenius' theorem</p> <p>Four lectures on stability and dissipativity:</p> <p>1. Lyapunov stability, 2. La Salle's invariance principle, 3. Lp stability, 4. Dissipativity</p> <p>Four lectures on optimal control:</p> <p>1. Optimal control, 2. Dynamic programming, 3. Maximum principle, 4. Control Lyapunov function and inverse optimality</p> <p>Three lectures on nonlinear control synthesis:</p> <p>1. Passivity and passivity theorem, 2. Hamiltonian systems and passivity based control, 3. Feedback linearization.</p> <p>The last lecture gives a summary.</p>					
<b>[Course requirements]</b>					
Dynamical Systems Control Theory					
<b>[Evaluation methods and policy]</b>					
The score will be evaluated based on reports.					
<div style="text-align: right;">Continue to 航空宇宙システム制御工学(2)</div>					

## 航空宇宙システム制御工学(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

H. Khalil 『Nonlinear Systems』 ( Prentice Hall ) ISBN:9780130673893

### [Study outside of class (preparation and review)]

Reports are asked for each unit. Review is necessary for each lecture.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG07 6G411 LJ77					
<b>Course title (and course title in English)</b>	航空宇宙流体力学 Fluid Dynamics for Aeronautics and Astronautics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,OOWADA TAKU Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,3times, ,3times, ,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG07 6G418 SJ77					
<b>Course title (and course title in English)</b>	航空宇宙工学特別実験及び演習第一 Experiments and Exercises in Aeronautics and Astronautics I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SENDA KEI		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Recent topics of advanced research in aeronautics and astronautics are studied from fundamental and application-oriented points of view. The research planning, literature survey/review, and original research training are supervised by professors in order to gain highly developed research skills.						
<b>[Course objectives]</b>						
The purpose is to grasp the current trend/important issues and establish the direction of one's research for master's thesis.						
<b>[Course schedule and contents]</b>						
Literature review, 5 times: Survey and review of recent original articles related to the master's thesis Seminar, 5 times: Report and discussion of the progress in one's research Exercise and experiments, 5 times: Exercise and experiments for the master's thesis The number of times and contents may be subject to change according to one's laboratory and the research topic.						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Grading is based on the attendance, the progress reports, the presentation and discussion at seminars.						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( Reference books ) References are suggested by supervisors according to the research topic.						
<b>[Study outside of class (preparation and review)]</b>						
Reading of the suggested references is required through the term.						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG07 6G420 SJ77					
<b>Course title (and course title in English)</b>	航空宇宙工学特別実験及び演習第二 Experiments and Exercises in Aeronautics and Astronautics II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SENDA KEI		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Recent topics of advanced research in aeronautics and astronautics are studied from fundamental and application-oriented points of view. Research training is supervised by professors for the research topic planned in Experiments and Exercises in Aeronautics and Astronautics I in order to further develop the research skills.						
<b>[Course objectives]</b>						
The purpose is to grasp the current trend/important issues and clarify the originality of one's research for master's thesis.						
<b>[Course schedule and contents]</b>						
Literature review, 5 times: Survey and review of recent original articles related to the master's thesis Seminar, 5 times: Report and discussion of the progress in one's research Exercise and experiments, 5 times: Exercise and experiments for the master's thesis The number of times and contents may be subject to change according to one's laboratory and the research topic.						
<b>[Course requirements]</b>						
Experiments and Exercises in Aeronautics and Astronautics I is a prerequisite in principle.						
<b>[Evaluation methods and policy]</b>						
Grading is based on the attendance, the progress reports, the presentation and discussion at seminars.						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) References are suggested by supervisors according to the research topic.						
<b>[Study outside of class (preparation and review)]</b>						
Reading of the suggested references is required through the term.						
( <b>Other information (office hours, etc.)</b> )						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG07 5M226 LJ58 G-ENG07 33410 LJ58				
<b>Course title (and course title in English)</b>	気象学 Meteorology I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Science Professor,ISHIOKA KEIICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
, 2 ~ 4 times, , 2 ~ 4 times, , 2 ~ 4 times, , 2 ~ 4 times, , 2 ~ 4 times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG07 5M227 LJ58 G-ENG07 44407 LJ58				
<b>Course title (and course title in English)</b>	気象学 Meteorology II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Science Professor,ISHIOKA KEIICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
, 3 ~ 4 times, , 3 ~ 4 times, , 3 ~ 4 times, , 3 ~ 4 times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG36 7R410 SJ71				
<b>Course title (and course title in English)</b>	航空宇宙機システムセミナー Seminar on Aerospace systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SENDA KEI Graduate School of Engineering Associate Professor, AOI SHINYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Mechanics, Vehicle Mechanics, Orbital Mechanics, etc.					
<b>[Course objectives]</b>					
To understand Aerospace Systems: Mechanics, Vehicle Mechanics, Orbital Mechanics, etc.					
<b>[Course schedule and contents]</b>					
Aerospace Systems: 15times 1. Reading textbooks 2. Reviewing journal papers					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluation depends on marks of presentation, report, and so on.					
<b>[Textbooks]</b>					
Instructed during class					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
Learn the basic mechanics and mathematics for analytical mechanics.					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG36 7R419 SJ71				
<b>Course title (and course title in English)</b>	システム制御工学セミナー Seminar on Systems and Control		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, MARUTA ICHIROU Graduate School of Engineering Professor, FUJIMOTO KENJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
To acquire the skills of grasping the trends of research related to control system theory particularly for aeronautics and astronautics.					
<b>[Course objectives]</b>					
To acquire the skills of grasping the trends of research related to control system theory particularly for aeronautics and astronautics.					
<b>[Course schedule and contents]</b>					
Fifteen seminars on control system theory and aerospace engineering will be organized.					
1. Paper reviews and presentation 2. Reading of books on specialized subjects 3. Research presentation					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
The score will be evaluated using reports.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
For presentation, preparation is required.					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG36 7V401 SJ71				
<b>Course title (and course title in English)</b>	電離気体工学セミナー Seminar on Engineering Science of Ionized Gases		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, ERIGUCHI KOUJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG36 7V405 SJ71				
<b>Course title (and course title in English)</b>	航空宇宙流体力学セミナー Seminar on Fluid Dynamics for Aeronautics and Astronautics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,OOWADA TAKU Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,14times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG36 7V436 SJ71					
<b>Course title (and course title in English)</b>	最適システム設計工学セミナー Seminar on Optimum System Design Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,NISHIWAKI SHINJI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,8times, ,7times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG36 7V412 SJ71				
<b>Course title (and course title in English)</b>	気体力学セミナー Seminar on Gas Dynamics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKATA SHIGERU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG36 7V413 SJ71				
<b>Course title (and course title in English)</b>	機能構造力学セミナー Seminar on Mechanics of Functional Solids and Structures		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, BIWA SHIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This Seminar is arranged to review advanced topics related to materials and structural systems involved in aeronautics and astronautics, as well as to nurture the presentation and discussion skills. Specific topics include the numerical methods for dynamic behavior of thin-walled structures and composite/functional materials, analysis of elastodynamic functional structures, and advanced experimental techniques for structural health monitoring.					
<b>[Course objectives]</b>					
The goal is to nurture the skills to survey and discuss advanced topics in the mechanics of functional materials and structures as well as structural health monitoring, and to utilize them in carrying out the research project.					
<b>[Course schedule and contents]</b>					
Weeks 1-3: Subject setting. Literature survey is to be carried out for advanced topics in the mechanics of functional materials and structures as well as structural health monitoring. Weeks 4-14: Presentation and discussion. The results of literature survey are presented and discussed with the critical evaluations for them. Week 15: Finalization. Literature survey is summarized.					
<b>[Course requirements]</b>					
Enrolling students are expected to have the fundamental knowledge of solid mechanics and to be willing to work on advanced topics in the mechanics of solids/structures.					
<b>[Evaluation methods and policy]</b>					
Grading is based on the literature survey, presentation, discussion and the final report.					
<b>[Textbooks]</b>					
No textbooks are assigned.					
Continue to 機能構造力学セミナー(2)					

## 機能構造力学セミナー(2)

### [References, etc.]

#### ( Reference books )

References are introduced when necessary.

#### ( Related URLs )

(URL is not available.)

### [Study outside of class (preparation and review)]

Enrolling students are expected to carry out the literature survey and to prepare the presentation.

### ( Other information (office hours, etc.) )

The time units of each stage are subject to change depending on each year's conditions and due to the discussion by Instructor and students.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG08 5C004 LJ57				
<b>Course title (and course title in English)</b>	場の量子論 Quantum Field Theory		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Assistant Professor, OGURE KENZOU Graduate School of Engineering Professor, MIYADERA TAKAYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
An introduction to quantum field theory is presented with an emphasis on its mathematical difficulties. We may use online materials. Check PandA in advance.					
<b>[Course objectives]</b>					
Our aim is to understand the difficulty of relativistic quantum field theory caused by the Poincare covariance and the infinite degrees of freedom.					
<b>[Course schedule and contents]</b>					
1. Introduction  Free field 2. Special relativity (1) 3. Special relativity (2) Poincare group 4. Relativistic quantum mechanics (1) Wigner's theorem 5. Relativistic quantum mechanics (2) Irreducible representation of Poincare group 6. Many particles 7. Free field (1) Klein-Gordon equation 8. Free field (2) Weyl algebra and Haag-Kastler axiom  Interaction 9. Classical theory 10. Deformation quantization 11. Wick ordering and microlocal analysis 12. Time ordered product 13. Time ordered product and Feynman diagram 14. Renormalization 15. Recent topics  1-14. Miyadera, 15. Ogure					
<b>[Course requirements]</b>					
Analysis, linear algebra, quantum mechanics					
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Continue to 場の量子論(2)					

場の量子論(2)

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**[Evaluation methods and policy]**

report

**[Textbooks]**

Not used

**[References, etc.]**

( Reference books )

None

**[Study outside of class (preparation and review)]**

Clarify what you have learnt and your questions.

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG08 7C013 LJ28				
<b>Course title (and course title in English)</b>	核材料工学 Nuclear Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKAGI IKUJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Nuclear fusion reactors and fission reactors present severe challenges such as high temperatures, high pressure, and high radiation fields, and the nuclear materials used in them are selected with reference to various properties. This course describes in detail major nuclear materials such as nuclear fusion reactor blankets, plasma facing materials, reactor pressure vessels, and fuel cladding, as well as other nuclear materials. Also, we hold roundtable discussions to learn about the latest breakthroughs in research and development.					
<b>[Course objectives]</b>					
The goal of the course is to understand how the performance and safety of systems such as nuclear fusion reactors and fission reactors are related to the properties of materials, and to comprehend trends in materials research for improving performance and safety.					
<b>[Course schedule and contents]</b>					
Fission reactor materials, 5 classes: Give an overview of fission reactors and discuss the below components.					
<ul style="list-style-type: none"> <li>- Fuel (recoverable reserves, uranium abundance ratio, nuclear cross sections, MOX)</li> <li>- Cladding material (zirconium alloy, corrosion, hydrogen embrittlement)</li> <li>- Control material (absorption cross sections, control rods, burnable poisons)</li> <li>- Moderators (scattering cross sections, moderating efficiency, diffusion length)</li> <li>- Coolants (thermal properties, radioactivation, furnace types)</li> <li>- Structural materials (pressure vessels, mechanical properties, radiation damages)</li> </ul>					
Nuclear fusion reactor materials, 4 classes: Give an overview of nuclear fusion reactors and explain their development history (tokamak, helical, inertial) as well as the below components.					
<ul style="list-style-type: none"> <li>- Structural materials (radioactivation, radiation damages, mechanical properties, effects of 14MeV neutrons)</li> <li>- Coil materials (alloy superconductivity, compound superconductivity)</li> <li>- Blankets (tritium breeding materials, neutron multiplication materials, fuel cycle)</li> <li>- Plasma facing materials (loss and redeposition, hydrogen recycling, tritium inventory and leakage)</li> </ul>					
Latest research trends, 5 classes: Students present information they have researched on the latest in research and development, and related question and answer sessions and debates are held.					
Feedback class, 1 lecture: Review the reports assigned in class as well as students' presentations and question and answer sessions.					
Continue to 核材料工学(2)					

## 核材料工学(2)

### [Course requirements]

None

### [Evaluation methods and policy]

Grade is based on active participation in class, including question and answer sessions, reports and presentations. Reports will be evaluated based on attainment of goals.

It is required to hand in both reports, and those that show independent thinking will be given high scores.

### [Textbooks]

In addition, printouts will be distributed in class.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

None.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG08 7C014 LJ28				
<b>Course title (and course title in English)</b>	核燃料サイクル工学 1 Nuclear Fuel Cycle 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,TAISHI KOBAYASHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The physical properties of actinides that form the basis of the "nuclear fuel cycle" from the natural uranium and thorium resources used in nuclear reactors as nuclear fuel, and from the nuclear reactor to disposal as waste The viewpoints of actinide aqueous solution chemistry (complexation, redox, solubility), chemistry in geological disposal environment, and dry reprocessing. Some lectures may be given in the form of presentations by students.					
<b>[Course objectives]</b>					
The goal is to understand the contents of the nuclear fuel cycle from the front end to the back end, and especially to know the chemical and physicochemical properties of nuclear fuel.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, Introduction to the nuclear fuel cycle Fuel, 3times, fuel properties, reactor nuclear reaction, spent fuel Actinide chemistry, 3times, Properties of actinide elements, spectroscopy, etc. Waste treatment disposal, 4times, advection-dispersion-diffusion, solubility, colloid, separation conversion Decommissioning, 1time, the current status of decommissioning technology, etc. Other topics, 2times, dry reprocessing, fusion reactor fuel cycle, etc. Feedback, once, confirmation of learning achievement					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Based on report evaluation of the issues on the contents of the nuclear fuel cycle.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
It is desirable to review mainly after the lecture.					
<b>( Other information (office hours, etc.) )</b>					
Exercise as needed. Some may be omitted or added depending on the number of classes in the relevant year.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG08 7C015 LJ28			
<b>Course title (and course title in English)</b>	核燃料サイクル工学2 Nuclear Fuel Cycle 2		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science Professor, YAMAMURA Tomoo Graduate School of Engineering Assistant Professor, TABATA CHIHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
原子力発電に関わる核燃料工学の中から，放射性廃棄物の計画・設計を行う際に必要となるアクチノイド凝縮系物質の基礎となる理論と応用を論ずる．アクチノイド物性化学の立場から，関連する放射化学、無機化学、固体物理学、金属工学に関する基礎事項を講述し，長寿命放射性廃棄物としての管理・保管・処理や、アルファ放射体としてのアクチノイド元素の医療応用における物理化学量の予測手法へ応用できる研究手法と解析方法を講述する．					
<b>[Course objectives]</b>					
燃材料に使われるアクチノイドにおける凝縮系諸相の構造、安定性、調製法や、周期系や孤立系の物質における電子秩序による準位形成のメカニズム、これらを利用した分光法や回折法、核反応のホストとしての材料としての捉え方に習熟する．					
<b>[Course schedule and contents]</b>					
<p>導入・放射化学(2回):核燃料サイクルで重要なアクチノイド物質の物性をエネルギー・スケール（エネルギーの点で高い方から低い方へ）と、周期性から孤立性への観点で進めていくことを説明する。原子炉(軽水炉、高速炉)で利用される核反応、研究炉を例とした燃料再処理、核医薬の製造と精製について説明する。</p> <p>元素・結晶構造(2回):結晶と解析法、結晶育成法に基づいてアクチノイド系列元素の固体の性質を説明する。</p> <p>バンド・結合(3回):固体物性(エネルギー・バンド、半導体、金属)、励起順位間の遷移を利用する分光研究について講述する。さまざまな構造を持つアクチノイド化合物（分子、塩）とこれらに対する量子化学計算に裏付けられる実験研究について説明する。</p> <p>格子振動(2回):フォノンの基礎と超伝導を説明する。固体の熱伝導、原子炉燃料、原子力電池などの燃材料についてアクチノイド固体結晶構造、圧力相図、融点の観点から説明する。</p> <p>平衡(2回):相図を用いてアクチノイド凝縮系諸相の熱的・構造的安定性を説明する。原子炉燃料として利用しうる相やその製造法を説明する。再処理、マイナーアクチノイドの分離・消滅に必要な電気化学、熱力学について説明する。</p> <p>磁性(2回):アクチノイドのf電子が示す常磁性における磁気モーメントの評価法、運動量の結合様式、基底項(状態)、結晶場と励起状態について説明する。励起状態としてゼーマン効果、分子振動も加え、この励起準位間の遷移を利用するアクチノイドの分光等について説明する。放射光や中性子を利用したアクチノイドの研究手法について最新の情報も含めて説明する。</p>					
Continue to 核燃料サイクル工学2(2)					

## 核燃料サイクル工学2(2)

### [Course requirements]

None

### [Evaluation methods and policy]

出席（40点）と講義で課するレポート（60点）

### [Textbooks]

Not used

### [References, etc.]

（Reference books）

C. キッテル 『キッテル 固体物理学入門 第8版』（丸善）ISBN:978-4621076569（固体物理の統一的な説明に優れています。上下巻別冊もあります。）

### [Study outside of class (preparation and review)]

参考書の該当する箇所に目を通しておくことを勧めます。

### （Other information (office hours, etc.)）

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG08 7C017 LJ57				
<b>Course title (and course title in English)</b>	放射線物理工学 Radiation Physics and Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KANNO IKUO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,5times, ,2times, ,2times, ,2times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG08 7C031 LJ57				
<b>Course title (and course title in English)</b>	量子制御工学 Quantum Manipulation Technology		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,TASAKI SEIJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,14times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG08 7C034 LJ28				
<b>Course title (and course title in English)</b>	核エネルギー変換工学 Nuclear Energy Conversion and Reactor Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, KAWARA ZENSAKU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,3times, ,2times, ,3times, ,2times, ,4times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG08 7C037 LJ28				
<b>Course title (and course title in English)</b>	混相流工学 Multiphase Flow Engineering and Its Application		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOMINE TAKEHIKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Reviewing of the fundamental definition and characteristics of multiphase flows, and to learn the governmental equations and some modelings of the constitutive equations and the current status of the multiphase flows. Moreover, to review and learn the fundamental definition and characteristics of particle flows, and to learn the numerical methods to track the particle laden flows and the particle measurement method.</p>					
<b>[Course objectives]</b>					
<p>As for the multiphase flows, to learn its fluid dynamics behaviors, governing equations and numerical methods, and finally to discuss its applications to many engineering fields.</p>					
<b>[Course schedule and contents]</b>					
<p>What#039s the multiphase flows?,1time,To review the definitions and fundamental characteristics of multiphase flows.</p> <p>Governing equation of gas-liquid two phase flows,2times,To learn the governing equation of gas-liquid two phase flows</p> <p>Modeling of gas-liquid two phase flows,2times,To learn modeling of gas-liquid two phase flows and its constitutive equations</p> <p>Numerical methods,3times,To learn the numerical methods to solve the single-phase and two-phase flows</p> <p>Examples of gas-liquid two phase flow analysis,1time,To show some examples of gas-liquid two phase flow analysis</p> <p>Characteristics of particle flows,1time,Review characteristics of particle flows</p> <p>Fundamental aspect of particle flows,1time,Explain variables and parameters subjected to interaction between particle and particle and/or particle and flow. Moreover, momentum and heat exchange between phases, i.e., to explain One-way, Two-way and Four-way coupling numerical methods.</p> <p>Particle methods,2times,Explain numerical method for thermofluid including static particles like a packed bed. Moreover, numerical methods for macroscopic and microscopic particles such as Discrete Element Method.</p> <p>Measurements of particle characteristics,2times,Review several measuring methods of particle characteristics and thermofluid behaviors</p>					
<b>[Course requirements]</b>					
None					
<p style="text-align: right;">Continue to 混相流工学(2)</p>					

## 混相流工学(2)

### **[Evaluation methods and policy]**

Present a summary of some papers regarding multiphase flows research by using a power point, and then answer several questions made by lecturers. The quality of your presentation and how deep understand your subject are the grading point.

### **[Textbooks]**

Handouts of the presentation will be provided in the lecture.

### **[References, etc.]**

( Reference books )

### **[Study outside of class (preparation and review)]**

### **( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG08 7C038 LJ28				
<b>Course title (and course title in English)</b>	核融合プラズマ工学 Physics of Fusion Plasmas		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,2times, ,2times, ,2times, ,1time, ,1time, ,3times, ,1time, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
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Continue to 核融合プラズマ工学(2)					

## 核融合プラズマ工学(2)

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG08 7C047 LJ68			
<b>Course title (and course title in English)</b>	放射線医学物理学 Medical Physics		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science Associate Professor,SAKURAI YOSHINORI Institute for Integrated Radiation and Nuclear Science Professor,TANAKA HIROKI Institute for Integrated Radiation and Nuclear Science Assistant Professor,TAKATA, Takushi	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Medical physics is the general term for the physics and technology which are supporting radiation diagnosis and therapy, and particle therapy. As it covers many different fields, the important subjects are "promotion for the advance of radiation therapy" and "quality assurance for radiation therapy". The scope of this course is to learn the fundamental knowledge for radiation medical physics. Especially, the focus is put on the understanding for (1) the bases of physics, biology and so on for radiation, (2) the physics for the radiations applied to diagnosis, (3) the characteristics of radiations and particle beams applied to therapy, and (4) the quality assurance and so on for radiation diagnosis and therapy.					
<b>[Course objectives]</b>					
To learn the fundamental knowledge of medical physics, mainly for radiation physics in diagnosis and therapy					
<b>[Course schedule and contents]</b>					
Introduction to medical physics for radiation,1time, Fundamental biology for radiation,1time, Radiation measurement and evaluation,2times, Physics in radiation diagnosis,4times, Physics in radiation therapy,5times, Quality assurance and standard dosimetry,1time, Achievement Assessment,1time,					
<b>[Course requirements]</b>					
It is recommended to attend the course, "Radiation Measurement for Medicine", concurrently.					
<b>[Evaluation methods and policy]</b>					
Attendance and reports					
<b>[Textbooks]</b>					
Not specified. Handouts will be given for each topic.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) F.M.Khan, "The Physics of Radiation Therapy: Mechanisms, Diagnosis, and Management" (Lippincott Williams and Wilkins, Baltimore, 2003)					
<b>[Study outside of class (preparation and review)]</b>					
Review the rudiments for radiation physics and radiation measurement.					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG08 6C050 PJ77					
<b>Course title (and course title in English)</b>	インターンシップM (原子核) Engineering Internship M		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, MATSUO JIROU		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG08 7C063 EJ28					
<b>Course title (and course title in English)</b>	原子核工学特別実験及演習第一 Experiments and Exercises on Nuclear Engineering, Adv.I			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times, ,6times, ,10times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG08 7C064 EJ28					
<b>Course title (and course title in English)</b>	原子核工学特別実験及演習第二 Experiments and Exercises on Nuclear Engineering, Adv.II			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times, ,6times, ,10times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG08 7C068 SJ28				
<b>Course title (and course title in English)</b>	原子力工学応用実験 Nuclear Engineering Application Experiments		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN Institute for Integrated Radiation and Nuclear Science Associate Professor, YAMAMOTO TOSHIHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Year-round
<b>Days and periods</b>	Mon.4,5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,10times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG08 5C070 LJ53				
<b>Course title (and course title in English)</b>	基礎量子科学 Introduction to Quantum Science		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SAITOU MANABU Graduate School of Engineering Associate Professor,MAJIMA TAKUYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,9times, ,2times, ,3times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG08 5C072 LJ28					
<b>Course title (and course title in English)</b>	基礎量子エネルギー工学 Introduction to Advanced Nuclear Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SASAKI TAKAYUKI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
To deepen the understanding of the background, current situation and issues of nuclear energy utilization, and introduce it to various nuclear engineering research. Mainly, the concept, model, etc. of reactor control and safety (reaction / shielding, etc.), nuclear power plant (development process / design), nuclear fuel cycle (processing / disposal), nuclear fusion (reaction / material), etc. And lectures, including theory and analysis methods.						
<b>[Course objectives]</b>						
Understand the basic concepts, models, and theories related to the use of nuclear energy required for nuclear engineering research, and their links to developmental research.						
<b>[Course schedule and contents]</b>						
Reactor basics, 2times, fission reaction, criticality, resonance / absorption, etc. Reactor control and safety, 2times, operation, accident, etc. Nuclear power plant, 2times, APWR / ABWR, design, next-generation reactors, etc. Nuclear fuel cycle, 3times, fuel, enrichment, cycle overview, disposal Basics of fusion, twice, fusion reaction, confinement method, etc. Fusion development, 3times, 1st wall, blanket, furnace design, etc. Feedback, 1time, confirmation of learning achievement						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
The attendance score (50) and the grade (50) for the assignment at the time of the lecture are comprehensively evaluated.						
<b>[Textbooks]</b>						
Instructed during class						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
Instruct during class.						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG08 5C074 LJ53			
<b>Course title (and course title in English)</b>	量子科学 Quantum Science		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,MATSUO JIROU Graduate School of Engineering Associate Professor,MAJIMA TAKUYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course involves fundamental interactions of electrons, ions and photons to atoms, molecules and condensed matters, and practical applications for nanotechnology. Great emphases are on fundamental mechanisms of beam-solid interactions, characterization techniques, material synthesis and processing for quantum devices with quantum beam. Recent progress of related area of quantum beam will be also introduced in this course.					
<b>[Course objectives]</b>					
To provide students to understand fundamental interactions in quantum science.					
<b>[Course schedule and contents]</b>					
Interactions between quantum beams and solids,7times,Interactions between quantum beams and solids are described with various formulas. Collisions with nucleus, electronic excitation, defect formation and energy loss will be discussed and related scientific topics, such as discovery of electron will be introduced. Applications of quantum beams,7times,The interactions of quantum beam are widely used for various applications. Material processing and analysis with quantum beams are essential in nanotechnology and quantum beams are also important for diagnostics of diseases and cancer therapy in medical field. Practical applications will be presented with recent progress and challenges. Final examination and report,1time,Evaluation will be given by the contents of the reports and quizzes of the subjects leaned in this course.					
<b>[Course requirements]</b>					
Solid state physics, Quantum mechanics(beginnersquos), Electromagnetism					
<b>[Evaluation methods and policy]</b>					
Coursework will be evaluated with attendance and report on subjects.					
<b>[Textbooks]</b>					
Ion-Solid Interactions: Fundamentals and Applications (Cambridge Solid State Science Series) M. Nastasi, J. Mayer, J. Hirvonen					
Continue to 量子科学(2)					

量子科学(2)

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG08 5C076 LE28			
<b>Course title (and course title in English)</b>	基礎電磁流体力学 Fundamentals of Magnetohydrodynamics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Professor,YOKOMINE TAKEHIKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course provides fundamentals of magnetohydrodynamics which describes the dynamics of electrically conducting fluids, such as plasmas and liquid metals. The course covers the fundamental equations in magnetohydrodynamics, dynamics and heat transfer of magnetofluid in a magnetic field, equilibrium and stability of magnetized plasmas, as well as illustrative examples.					
<b>[Course objectives]</b>					
The students can understand fundamentals of magnetohydrodynamics which describes the dynamics of electrically conducting fluids, such as plasmas and liquid metals. Moreover, the students will figure out the applications of magnetohydrodynamics to the various science and engineering fields.					
<b>[Course schedule and contents]</b>					
Liquid Metal MHD,7times,1. Introduction and Overview of Magnetohydrodynamics 2. Governing Equations of Electrodynamics and Fluid Dynamics 3. Turbulence and Its Modeling 4. Dynamics at Low Magnetic Reynolds Numbers 5. Glimpse at MHD Turbulence amp Natural Convection under B field 6. Boundary Layers of MHD Duct Flows 7. MHD Turbulence at Low and High Magnetic Reynolds Numbers Plasma MHD,8times,1. Introduction to Plasma MHD 2. Basic Equation of Plasma MHD 3. MHD Equilibrium 4. Axisymmetric MHD Equilibrium 5. Ideal MHD Instabilities 6. Resistive MHD Instabilities 7. MHD Waves in Plasmas 8. Student Assessment					
<b>[Course requirements]</b>					
Fundamental fluid dynamics and electromagnetics should be learned prior to attend this lecture.					
<b>[Evaluation methods and policy]</b>					
Attendance and two reports					
<b>[Textbooks]</b>					
Handout of the presentation will be provided at the lecture					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) P. A. Davidson, "An Introduction to Magnetohydrodynamics," Cambridge texts in applied mathematics, Cambridge University Press, 2001					
<b>[Study outside of class (preparation and review)]</b>					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG08 7C078 LJ53					
<b>Course title (and course title in English)</b>	複合加速器工学 Advanced Accelerator Technology		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science Associate Professor, YOSHIHIRO ISHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Particle accelerator is essential for proceeding nuclear and particle physics but also becomes a very important tool for future nuclear sciences and engineering. In this lecture, a basics theory of accelerator physics including beam optics and dynamics of the circular accelerators is given, and also various applications of the accelerators are also presented.						
<b>[Course objectives]</b>						
This lecture aims to learn a basic accelerator theory and to attain abilities to make a primitive design of circular accelerator.						
<b>[Course schedule and contents]</b>						
History and outline of particle accelerator, 1time, Basic theory of beam dynamics in circular accelerator, 1time, Major components of accelerators, 1time, Orbit theories of the beam, 3times, Theory of radio frequency acceleration, 2times, Practice of accelerator designing, 2times, Non linear beam dynamics and others, 4times, Summary and check the accomplishment, 1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Reports on practical issues and subjects.						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) S.Y.Lee, Accelerator Physics, World Scientific (1999), J.J.Livingood, Cyclic Particle Accelerator, Van Nostland, New York (1961). E.D. Courant and H.S.Snyder, Ann. Physics, 3,1(1958).						
<b>[Study outside of class (preparation and review)]</b>						
特になし						
( <b>Other information (office hours, etc.)</b> )						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG08 7C080 LJ28				
<b>Course title (and course title in English)</b>	原子炉安全工学 Nuclear Reactor Safety Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science Professor, NAKAJIMA KEN Institute for Integrated Radiation and Nuclear Science Associate Professor, YAMAMOTO TOSHIHIRO Institute for Integrated Radiation and Nuclear Science Associate Professor, HORI JIYUNICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,4times, ,3times, ,5times, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG08 7C082 LJ52				
<b>Course title (and course title in English)</b>	応用中性子工学 Applied Neutron Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science Associate Professor,HINO MASAHIRO Institute for Integrated Radiation and Nuclear Science Associate Professor,CHATAKE TOSHIYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Neutrons are very powerful and useful tool for advanced science and technology. In particular, low-energy neutrons which are called thermal or cold neutron are well used not only for static and dynamic structure analysis by scattering, but also quantitative elemental analysis by irradiation. In the course, we offer the structures and characteristics of the research reactor and spallation neutron source,respectively. We also offer lectures on the latest trends in basic physics research and material and life science research, and neutron imaging research.					
<b>[Course objectives]</b>					
<ul style="list-style-type: none"> <li>• To understand generation of low-energy neutrons and their application.</li> </ul>					
<b>[Course schedule and contents]</b>					
1-2: Outline to application of neutron beam and irradiation, 3-4: Neutron facilities (research reactors and spallation neutron sources) 5-6: Neutron optics and the application for basic physics research 7-9: Introduction to neutron scattering 10-13:Application of life science with neutron scattering 14-15: Neutron imaging and their application.					
<b>[Course requirements]</b>					
None					
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Continue to 応用中性子工学(2)					

## 応用中性子工学(2)

### [Evaluation methods and policy]

Evaluation will be based on active participation (40points) and an assignment report (60points) . The active participation includes small quizzes related the lectures. Assignments and individual reports will be assessed on the basis of achievement level for course goals.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Before the lecture: Interest in radiation utilization and understand basics of radiation measurement

After the lecture: Communicates with faculty members by Panda.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG08 6C084 LJ28				
<b>Course title (and course title in English)</b>	原子核工学最前線 Nuclear Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, TSUCHIDA HIDETSUGU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,13times, ,2times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG08 9C086 LJ28				
<b>Course title (and course title in English)</b>	原子核工学序論 1 Introduction to Nuclear Engineering 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SASAKI TAKAYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Study of basic concepts necessary for understanding the principles of various nuclear engineering studies from the physicochemical properties of atoms, nuclei, and radiation to the generation and use of energy by fission reactions.					
<b>[Course objectives]</b>					
The course objective is to understand the link between basic science and the latest research in the field of nuclear engineering, and to understand the latest advancements made in basic and applied research and future issues.					
<b>[Course schedule and contents]</b>					
<p>Introduction to Radiation 1</p> <ol style="list-style-type: none"> <li>1) Discovery of radiation</li> <li>2) History of radiation</li> <li>3) Basics of radiation</li> <li>4) Interaction with substances</li> <li>5) Detection of radiation</li> <li>6) Generation of radiation</li> <li>7) Industrial uses of radiation</li> </ol> <p>Energy generation and utilization 1</p> <ol style="list-style-type: none"> <li>8) Energy situation and nuclear power</li> <li>9) Basics of reactor physics</li> <li>10) Reactor control</li> <li>11) Reactor selection-present</li> <li>12) Reactor selection-past</li> <li>13) Reactor selection-next generation reactor</li> <li>14) Viewpoints on nuclear energy utilization and development</li> <li>15) Feedback; confirmation of learning achievement</li> </ol>					
Continue to 原子核工学序論 1 (2)					

## 原子核工学序論 1 (2)

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### [Course requirements]

None

### [Evaluation methods and policy]

Grading is based on the score of the periodic evaluations. Students will be tested on basic knowledge and understanding of atoms, nuclei, radiation, quantum computation, etc. discussed in each lecture.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Review mainly the contents of each lecture and the exercises during the lecture is advisable.

### ( Other information (office hours, etc.) )

Attend as needed. Some materials may be omitted or added depending on the number of classes in the relevant year. Attending Introduction to Nuclear Engineering 2 at the same time as this course is desirable.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG08 9C087 LJ28				
<b>Course title (and course title in English)</b>	原子核工学序論 2 Introduction to Nuclear Engineering 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SASAKI TAKAYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Study of the fundamentals of radiation properties and their control, and energy utilization and management, necessary for understanding the principles of various nuclear engineering studies.					
<b>[Course objectives]</b>					
The course objective is to understand the association between basic science and the latest research in the field of nuclear engineering, and to understand the latest advancements made to basic and applied research and future issues.					
<b>[Course schedule and contents]</b>					
<p>Introduction to Radiation 2</p> <ol style="list-style-type: none"> <li>1) Radiation biology</li> <li>2) Medical application of radiation</li> <li>3) Effects of radiation on the human body</li> <li>4) Safe use of radiation</li> <li>5) Radiation-related laws and regulations</li> </ol> <p>New developments in quantum theory</p> <ol style="list-style-type: none"> <li>6) Cutting-edge information technology</li> </ol> <p>Energy generation and utilization 2</p> <ol style="list-style-type: none"> <li>7) History and fundamentals of nuclear fusion</li> <li>8) Fusion reactor development</li> <li>9) Power reactor systems</li> <li>10) Ensuring safety</li> <li>11) Technical ethics</li> <li>12) Radiation in the environment</li> <li>13) Nuclear fuel cycle</li> <li>14) Reprocessing and geological disposal</li> <li>15) Feedback; confirmation of learning achievement</li> </ol>					
Continue to 原子核工学序論 2 (2)					



## 原子核工学序論 2 (2)

### [Course requirements]

None

### [Evaluation methods and policy]

Grading is based on the score of the periodic evaluations. Students will be tested on basic knowledge and understanding of atoms, nuclei, radiation, quantum computation, etc. discussed in each lecture.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Review mainly the contents of each lecture and the exercises during the lecture is advisable.

### ( Other information (office hours, etc.) )

Attending Introduction to Nuclear Engineering 1 is desirable. Exercises and report tasks will be assigned as necessary. Some materials may be omitted or added depending on the number of classes in the relevant year.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG08 7C089 SJ28					
<b>Course title (and course title in English)</b>	原子核工学セミナー A Seminar on Nuclear Engineering A, B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU		
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,10times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG08 7C090 SJ28					
<b>Course title (and course title in English)</b>	原子核工学セミナーB Seminar on Nuclear Engineering A, B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU		
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,10times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG38 7R001 LJ53				
<b>Course title (and course title in English)</b>	量子ビーム科学特論 Quantum Beam Science, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,MATSUO JIROU Graduate School of Engineering Associate Professor,TSUCHIDA HIDETSUGU Graduate School of Engineering Professor,SAITOU MANABU Graduate School of Engineering Associate Professor,MAJIMA TAKUYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
, 6 times, , 4 times, , 2 times, , 2 times, , 1 times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG38 5R004 LJ57				
<b>Course title (and course title in English)</b>	量子物理学特論 Quantum Physics, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MIYADERA TAKAYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Keywords: Foundations of quantum theory, quantum information theory.					
<b>[Course objectives]</b>					
To understand recent progress of the quantum foundations.					
<b>[Course schedule and contents]</b>					
Quantum theories and their applications (14times) We study a relevant textbook and related topics. Confirmation of achievement in study, 1time,					
<b>[Course requirements]</b>					
quantum physics					
<b>[Evaluation methods and policy]</b>					
Presentations and discussions					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Each participant is required to read papers in advance.					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG38 7R013 LE59				
<b>Course title (and course title in English)</b>	非線形プラズマ工学 Nonlinear Physics of Fusion Plasma		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course provides a comprehensive introduction to computational modeling and simulation of magnetically confined fusion plasmas. Topics include elements of nonlinear plasma physics, modeling of various phenomena in fusion plasmas, computational methods in plasma physics, and integrated simulation of fusion plasmas					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Nonlinear Phenomena in Plasma Physics,1time,Review of nonlinear phenomena in plasmas; modeling of plasmas Nonlinear Waves in Plasmas,2times,Nonlinear ion acoustic waves; Korteweg de Vries equation; Soliton; Nonlinear Schrodinger equation Wave-Particle Interaction in Plasmas,2times,Linear wave particle resonant interaction; Landau damping; Trapping in a single wave: Nonlinear interaction with waves; Stochastic particle motion; Quasi-linear interaction Wave-Wave Interaction in Plasmas,2times,Parametric instability; Three-wave interaction Numerical Analysis of Differential Equations,4times,Basics of numerical simulations; Ordinary differential equation; Partial differential equation; Matrix solver Numerical Simulation of Fusion Plasmas,3times,Numerical simulation of fusion plasmas: equilibrium, transport, heating and current drive, stability, energetic particles, integrated modeling Assessment of Achievement,1time,Assessment of Achievement					
<b>[Course requirements]</b>					
Plasma Physics, Fundamental Magnetohydrodynamics, Fusion Plasma Physics, or equivalents					
<b>[Evaluation methods and policy]</b>					
Report in English					
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Continue to 非線形プラズマ工学(2)					

## 非線形プラズマ工学(2)

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### [Textbooks]

None

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG38 7R017 PB77				
<b>Course title (and course title in English)</b>	インターンシップD (原子核) Engineering Internship D		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, MATSUO JIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG38 7R019 SB28					
<b>Course title (and course title in English)</b>	原子核工学特別セミナー A Seminar on Nuclear Engineering, Adv. A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,10times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG38 7R021 SB28					
<b>Course title (and course title in English)</b>	原子核工学特別セミナー B Seminar on Nuclear Engineering, Adv. B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,10times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG38 7R023 SB28					
<b>Course title (and course title in English)</b>	原子核工学特別セミナー C Seminar on Nuclear Engineering, Adv. C		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,10times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG38 7R025 SB28					
<b>Course title (and course title in English)</b>	原子核工学特別セミナー D Seminar on Nuclear Engineering, Adv. D		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,10times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG38 7R027 SB28					
<b>Course title (and course title in English)</b>	原子核工学特別セミナー E Seminar on Nuclear Engineering, Adv. E		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,10times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG38 7R029 SB28					
<b>Course title (and course title in English)</b>	原子核工学特別セミナー F Seminar on Nuclear Engineering, Adv. F		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,10times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG08 7W620 LJ52				
<b>Course title (and course title in English)</b>	医学放射線計測学 Radiation Measurement for Medicine		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, TSUCHIDA HIDETSUGU Institute for Integrated Radiation and Nuclear Science Associate Professor, SAKURAI YOSHINORI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Fundamentals for Physical Effects of Radiation Interactions, 2times, Fundamentals for Chemical Effects of Radiation Interactions, 1time, Fundamental Quantities and Units for Radiation, 2times, Radiation Measurements in Medical Physics, 3times, Radiation Dosimetry, 2times, Estimation for Dose Distribution, 2times, Techniques for Radiation Control and Measurement in Medical Radiation Field, 1time, Laws and Ordinances for Radiation Therapy, 1time, Check of Study Achievement, 1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG09 5C209 LJ75			
<b>Course title (and course title in English)</b>	非鉄製錬学特論 Non-ferrous extractive metallurgy, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, UDA TETSUYA Graduate School of Engineering Associate Professor, TOYOURA KAZUAKI Graduate School of Engineering Program-Specific Associate Professor, Kouji Yasuda	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,1time, ,1time, ,2times, ,1time, , 1 times, ,2times, ,1time, ,2times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
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Continue to 非鉄製錬学特論(2)					



非鉄製錬学特論(2)

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG09 5C212 LJ75			
<b>Course title (and course title in English)</b>	物質情報工学 Materials Informatics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAWAI JIYUN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Fourier transform of physical data, data processing such as smoothing, ISO standard of analysis, detection limit, and error will be discussed.					
<b>[Course objectives]</b>					
Learn how to obtain materials information from data measured for your graduate research.					
<b>[Course schedule and contents]</b>					
Central limit theorem (Central limit theorem, generating functions, normal distribution, standard deviation)---2					
Sampling and accuracy (Detection limit, ISO standard)---1					
Smoothing (Least-squares method, Savitzky-Golay smoothing, peak separation)---1					
Problem 1.					
Fourier transform (Fourier transform, convolution/deconvolution)---2					
Problem 2.					
Entropy (Akaike's information criteria, spline function, Tsallis entropy)---2					
Difference between heat and temperature (Laplace transform)---1					
Canonical ensemble (Probability and Laplace transform)---1					
Green function and density matrix (Similarity between Schrödinger equation and diffusion equation)---2					
JIS and ISO standards---1					
Materials informatics---1					
Feedback---1					
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Continue to 物質情報工学(2)					

## 物質情報工学(2)

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### [Course requirements]

None

### [Evaluation methods and policy]

Submission of reports.

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Report problems are rather heavy.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG09 5C214 LJ75			
<b>Course title (and course title in English)</b>	凝固・結晶成長学 Microstructure, solidification and crystal growth		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, NOSE YOSHITAROU Graduate School of Engineering Professor, HIDEYUKI YASUDA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
To learn science and technologies on solidification and crystal growth, which are fundamentals of processing for fabrication of almost materials. We talk on microstructures during solidification and crystal growth based on kinetics and thermodynamics including phase diagrams. To understand formation mechanism of microstructures in materials such as metals and relationship between microstructures and properties in materials.					
<b>[Course objectives]</b>					
To understand science on solidification and crystal growth. To study a way of considering to control microstructures in materials processing, and to learn formation mechanism of microstructures from the viewpoints of thermodynamics and kinetics.					
<b>[Course schedule and contents]</b>					
(1) Introduction 【1 week】 (2) Crystal growth and devices on thin film materials 【6-7 weeks】 (3) Solidification, and selection of microstructures and phases 【6-7 weeks】 (4) Feedback 【1 week】					
<b>[Course requirements]</b>					
It is desirable to have learned thermodynamics, transport phenomena, microstructures in materials, and corresponding subjects, but it is not necessary.					
<b>[Evaluation methods and policy]</b>					
Evaluation will be based on reports.					
<b>[Textbooks]</b>					
Utilizing resumes provided in the lecture.					
<b>[References, etc.]</b>					
( Reference books ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
To review contents in the last time before the lecture. See lecture videos if necessary.					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG09 7C240 EJ75					
<b>Course title (and course title in English)</b>	材料工学特別実験及演習第一 Laboratory & Seminar in Materials Science and Engineering, Adv. I			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,5times, ,5times, ,10times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG09 7C241 EJ75					
<b>Course title (and course title in English)</b>	材料工学特別実験及演習第二 Laboratory & Seminar in Materials Science and Engineering, Adv. II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,5times, ,5times, ,10times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG09 7C251 SJ75				
<b>Course title (and course title in English)</b>	材料工学セミナー A Seminar on Materials Science and Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,12times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG09 7C253 SJ75					
<b>Course title (and course title in English)</b>	材料工学セミナー B Seminar on Materials Science and Engineering B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,1time, ,12times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG09 5C263 LJ75				
<b>Course title (and course title in English)</b>	結晶物性学特論 Physical Properties of Crystals Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, INUI HARUYUKI Graduate School of Engineering Associate Professor, KISHIDA KIYOUSUKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Various physical properties of crystalline materials are strongly affected by their crystal symmetry and also by their texture developed through forming and heat-treatment processes. In this course, fundamentals of crystal structure, crystal defects and crystal plasticity as well as their relationship with mechanical and functional properties will be lectured.					
<b>[Course objectives]</b>					
This class aims to help students to acquire fundamentals to control various properties of crystalline materials through understanding the influences of crystal symmetry on various properties of crystalline materials.					
<b>[Course schedule and contents]</b>					
Week 1: Basic theory of elasticity Week 2: Yield criteria and plastic deformation of single crystals Week 3: Plastic deformation of polycrystals Week 4: Fundamentals of texture Week 5: Anisotropic properties of crystalline materials Week 6: Deformation twinning Week 7: Grain boundaries Week 8: Symmetry elements and crystal symmetry Week 9: Crystal symmetry and diffraction Week 10: Intermetallic compounds and lattice defects Week 11: Planar defects in intermetallic compounds Week 12: Dislocations and plastic deformation of intermetallic compounds Week 13,14: Improvement of plastic deformability of intermetallic compounds Week 15: Feedback					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluation will be based on individual reports.					
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Continue to 結晶物性学特論(2)					

## 結晶物性学特論(2)

### [Textbooks]

Hand out materials will be provided during the lecture.

### [References, etc.]

#### ( Reference books )

山口正治，乾 晴行，伊藤和博 『金属間化合物入門』（内田老鶴圃）ISBN:4-7536-5621-7

### [Study outside of class (preparation and review)]

To review contents covered in the previous lecture.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG09 5C267 LJ75    G-ENG09 6C267 LJ75				
<b>Course title (and course title in English)</b>	セラミックス材料学 Ceramic Materials Science		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TANAKA ISAO Graduate School of Engineering Associate Professor, SEKO ATSUTO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This lecture covers the mechanical, optical, and electronic properties of ceramics, their microscopic mechanisms, and fundamental knowledge required for the design of ceramics. Applications of advanced experimental and theoretical approaches to ceramic research are also discussed.					
<b>[Course objectives]</b>					
Systematic understanding of the properties of ceramics on macroscopic and microscopic scales and learning approaches to the issues in ceramic research.					
<b>[Course schedule and contents]</b>					
<p>Introduction to ceramics, 2times, Overview of the history and commercial applications of ceramics.</p> <p>Fundamentals of ceramics, 4times, Fundamentals of ceramics such as crystal structure, electronic structure, and thermodynamical properties. The atomic and electronic structure of point defects, surfaces, grain boundaries, and their impacts on the properties of ceramics.</p> <p>Structural ceramics, 2times, Mechanical properties of ceramics.</p> <p>Energy ceramics, 2times, Ceramics for energy applications and their understanding from the viewpoint of the atomic and electronic structure.</p> <p>Optical and electronic ceramics, 4times, Optical and electronic properties of ceramics for laser and electronic device applications and their understanding from the viewpoint of the atomic and electronic structure.</p> <p>Assessment of mastery of the course content, 1time, The mastery of the course content is assessed.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluations are made based on the examination or reports.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
<p>( <b>Reference books</b> )</p> <p>Carter, C. Barry et al. 『Ceramic Materials』 ( Springer, 2013 ) ISBN:9781461435228 ( Some Figures and Tables in this book will be explained during the lecture. )</p>					
Continue to セラミックス材料学(2)					

## セラミックス材料学(2)

Yet-Ming Chiang et al. 『Physical Ceramics』 ( John Wiley and Sons, 1996 ) ISBN:0471598739 ( A revised edition of a standard textbook. )

Anthony R. West 『Solid State Chemistry and its Applications』 ( Wiley, 2014 ) ISBN:1119942942 ( A standard textbook for solid state chemistry )

### [Study outside of class (preparation and review)]

Video slides of the lecture will be uploaded on Panda.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG09 5C271 LJ75				
<b>Course title (and course title in English)</b>	磁性物理 Magnetism and Magnetic Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAMURA HIROYUKI Graduate School of Engineering Associate Professor, TABATA YOSHIKAZU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Fundamental magnetism of condensed matters and application of magnetic materials are lectured.					
<b>[Course objectives]</b>					
Systematic understanding of magnetic properties of condensed matters and learning application of magnetic materials					
<b>[Course schedule and contents]</b>					
1. Magnetic moment of atom electronic states and stability of magnetic moment of atom, intra-atomic electron correlations, spin-orbit interaction, crystal-electric field  2. Curie and Pauli paramagnetism magnetism in the localized- and itinerant-limited electron systems without spin-spin interactions  3-6. Magnetic phase transition in the localized spin system exchange interaction, Heisenberg and Ising models, mean-field approximation, spin wave  7-8. Antiferromagnet and other magnetic states antiferromagnet, metamagnetic transition, frustration, quantum spin, topological order  9-11. Itinerant electron magnetism Hubbard model, Stoner theory, spin density wave  12. Ferromagnetic materials magnetic anisotropy, magnetostriction, magnetic domain, etc.  13. Hard and Soft magnets fundamental and application of permanent magnetic materials and soft magnetic materials  14. Magnetic record and spintronics fundamental and application of magnetic record and spintronics  15. Conclusion					
Continue to 磁性物理(2)					

## 磁性物理(2)

### [Course requirements]

Fundamental knowledge of quantum mechanics, electromagnetism, thermodynamics, and statistical physics. It is desirable to have already taken "Condensed Matter Physics, 3rd year, Materials Science and Engineering".

### [Evaluation methods and policy]

Evaluations are made based on the reports.

### [Textbooks]

Printed matters will be distributed.

### [References, etc.]

#### ( Reference books )

志賀正幸 『材料学シリーズ「磁性入門」』 ( 内田老鶴圃 )

Stephen Blundell 『Magnetism in Condensed Matter (Oxford Master Series in Physics)』 ( Oxford University Press )

白鳥紀一・近桂一郎 『磁性学入門』 ( 裳華房 )

### [Study outside of class (preparation and review)]

Fundamental knowledge of quantum mechanics, electromagnetism, thermodynamics, and statistical physics.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



社会基盤材料特論 (2)

[Textbooks]

[References, etc.]

( Reference books )

[Study outside of class (preparation and review)]

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.





社会基盤材料特論 (2)

**[Textbooks]**

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG09 8C277 PJ75				
<b>Course title (and course title in English)</b>	インターンシップM (材料工学) Internship in Materials Science & Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Kyoto University Not fixed	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,13times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG09 5C286 LJ75			
<b>Course title (and course title in English)</b>	原子分子工学特論 Atomic-molecular scale engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SUGIMURA HIROYUKI Graduate School of Engineering Associate Professor, KUROKAWA SHIYUU Graduate School of Engineering Associate Professor, ICHII TAKASHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
材料科学の基礎となる熱力学を学ぶ。まず、高校で学習した熱化学との違いを認識し、その上で、熱力学の諸法則を説明するとともに、理想気体の状態変化、相変化、自由エネルギー、平衡と相律、相図、混合物の熱力学などの基礎的事項について講述する。					
<b>[Course objectives]</b>					
本講義を学習することで、各種材料の研究開発に必要とされる、より高度な熱力学をさらに学習していくための基盤となる基礎的な知識を得る。特に、エントロピー、エンタルピー、自由エネルギーについて学習し、物質の状態変化と化学反応について熱力学的に考察する意味を理解する。					
<b>[Course schedule and contents]</b>					
<p>熱力学の概説（2～3回） 熱力学とは、どのような学問かについてその概略について述べる。また、熱力学で使われる諸量と単位について説明し、さらに、気体の性質および分子運動論、ボルツマン分布等について解説する。</p> <p>熱力学第一法則と第二法則（3回） 熱力学第一法則、熱の定義、準静的過程、比熱の式、エンタルピー、理想気体への第一法則の適用について解説する。さらに、可逆過程と不可逆過程、第二法則、カルノーサイクル、エントロピー、理想気体サイクルの諸項目について解説する。</p> <p>自由エネルギー（2～3回） 自由エネルギー、熱力学的性質の相互関係、化学平衡などについて解説する。</p> <p>純物質および単純な混合物の熱力学（3回） 純物質の物理的な変化、混合物の熱力学について解説する。相平衡、ギブズの相律、相図、理想気体の混合などが含まれる。</p> <p>混合物の熱力学と化学平衡（3回） 溶液の熱力学、化学ポテンシャル、活量、熱力学の化学平衡への応用について解説する。</p> <p>学習到達度の確認（1回） 学習到達度を確認する。</p> <p>講義内容の理解度を高めるため、各講義時間中に小演習（不定期）を実施する。</p>					
Continue to 原子分子工学特論(2)					

## 原子分子工学特論(2)

### [Course requirements]

全学共通科目の微分積分学の履修を前提としている。

### [Evaluation methods and policy]

平常点評価 (50点)

期末試験 (50点)

平常点評価は、講義への参加状況、講義時間中に実施する小演習への参加状況を含む。

### [Textbooks]

共著 『熱力学 - 基礎と演習』 (朝倉書店) ISBN:9784254250367

講義の際に、参考資料も配布する。

### [References, etc.]

#### ( Reference books )

アトキンス 『物理化学要論』 (東京化学同人) ISBN:9784807908912

アトキンス 『物理化学 (上)』 (東京化学同人) ISBN:9784807906956

バーロー 『物理化学 (上)』 (東京化学同人) ISBN:9784807906956

マッカーリ & サイモン 『物理化学 (下)』 (東京化学同人) ISBN:9784807905096

参考書がなくても受講にはさしつかえありませんが、より深く学習する場合の参考にしてください。

### [Study outside of class (preparation and review)]

授業は配布資料の順番で進めます。教科書と配布資料を照らし合わせつつ予習復習してください。各小演習の終了後、解答例を配布しますので、解けなかった場合は復習してください。教科書記載の演習問題も、解いてみることを推奨します。

### ( Other information (office hours, etc.) )

本講義は、材料科学コースの2回生向けに行われる。

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG09 5C288 LJ75				
<b>Course title (and course title in English)</b>	材料組織・構造評価学 Microstructure theory and structure evaluation		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI Graduate School of Engineering Associate Professor, YUGE KORETAKA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,2times, ,3times, ,3times, ,2times, ,4times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG09 5C289 LJ75				
<b>Course title (and course title in English)</b>	先進構造材料特論 Advanced Structural Metallic Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUJI NOBUHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Structural metallic materials, in particular steels, achieve their various mechanical properties based on microstructural control in micro and nano scales. This lecture treats mainly steels, and explains the mechanism of microstructure formation by solid state reactions (phase transformation / precipitation / recrystallization), and relationship between microstructure and mechanical properties. Moreover, the lecture introduces the new metallurgy for developing microstructural control methodology.					
<b>[Course objectives]</b>					
Understanding the microstructure formation mechanism by phase transformation / precipitation / recrystallization, and acquiring the knowledge for improvement of mechanical properties through microstructural control in micro and nano scales.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, Overview of the lecture Formation mechanism of microstructure, 8times, 1. Iron and Steel, 2. Phase diagram of steel, 3. Diffusional phase transformation, 4. Diffusionless phase transformation (martensitic transformation), 5. Precipitation, 6. Recrystallization Microstructural control methodology, 5times, 1. Relationship between microstructure and mechanical properties, 2. Thermomechanical processing, 3. New metallurgy for microstructural control , 1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluations are made based on attendance and report					
<b>[Textbooks]</b>					
Materials will be distributed.					
<b>[References, etc.]</b>					
( Reference books ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
The review of materials that are distributed during the class is strongly recommended.					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG09 5C290 LJ75				
<b>Course title (and course title in English)</b>	材料電気化学特論 Electrochemistry for Materials Processing, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MURASE KUNIAKI Graduate School of Engineering Associate Professor, FUKAMI KAZUHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Modern electroplating, 4times, Thermodynamics of electrodeposition, 2times, Corrosion engineering and anodization, 4times, Semiconductor electrochemistry, 2times, Advanced materials electrochemistry, 2times, Self-assessment of achievement, 1time,					
<b>[Course requirements]</b>					
Knowledge of fundamental electrochemistry and chemical thermodynamics are required.					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
No textbook is required for this course.					
<b>[References, etc.]</b>					
( Reference books )					
( Related URLs )					
(Not available)					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
Not available					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG39 7R241 SJ75				
<b>Course title (and course title in English)</b>	材料工学特別セミナー A Seminar on Materials Science and Engineering, Adv.A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,12times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG39 7R242 SJ75					
<b>Course title (and course title in English)</b>	材料工学特別セミナー B Seminar on Materials Science and Engineering, Adv.B			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,1time, ,12times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG39 7R243 SJ75				
<b>Course title (and course title in English)</b>	材料工学特別セミナー C Seminar on Materials Science and Engineering, Adv.C		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,12times, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG39 7R244 SJ75					
<b>Course title (and course title in English)</b>	材料工学特別セミナー D Seminar on Materials Science and Engineering, Adv.D			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,1time, ,12times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG39 7R245 SJ75					
<b>Course title (and course title in English)</b>	材料工学特別セミナー E Seminar on Materials Science and Engineering, Adv. E		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,1time, ,12times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG39 7R247 SJ75					
<b>Course title (and course title in English)</b>	材料工学特別セミナーF Seminar on Materials Science and Engineering, Adv.F		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OKUDA HIROSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,1time, ,12times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG10 5C604 LJ72			
<b>Course title (and course title in English)</b>	応用システム理論 Applied Systems Theory		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Liberal Arts and Sciences Associate Professor,TANAKA SHIYUNJI Graduate School of Engineering Professor,SAKAMOTO TAKUYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The course deals with mathematical methods of system optimization mainly for combinatorial optimization problems. It covers such topics as the integer optimization and its typical problems, exact solution methods including the dynamic programming and the branch and bound method, approximate solution methods including the greedy method, meta-heuristics including the genetic algorithms, the simulated annealing method, and the tabu search.					
<b>[Course objectives]</b>					
To acquire the knowledge on formulation of combinatorial optimization problems into integer programming problems, basic concepts, algorithms, characteristics, and application procedures of exact solution methods, approximate solution methods, and meta-heuristics.					
<b>[Course schedule and contents]</b>					
1. Combinatorial optimization problems and complexity (1-2 weeks) - necessity and importance of combinatorial optimization, typical problems, complexity, classes P and NP, complexity of combinatorial optimization problems, limitation of exact solution methods, necessity of approximate solution methods and metaheuristics  2. Exact solution methods (3 weeks) - Principle of Optimality, dynamic programming, branch-and-bound method, and their applications  3. Integer programming (2-3 weeks) - formulation as integer programming problem, relaxation problem, and cutting plane algorithm  4. Approximate solution methods (2-3 weeks) - greedy method, integer rounding method, beam search, etc.  5. Metaheuristics (3-4 weeks) - local search, basic ideas behind metaheuristics, iterated local search, variable neighborhood search, genetic algorithms, simulated annealing method, tabu search, etc.  6. Multiobjective optimization (1-2 weeks) - importance of multiobjective optimization, theoretical backgrounds, and solution methods.					
The number of weeks for each topic is subject to change according to the students' level of understanding. We will provide the schedule of 15 weeks in the class so that the students will be able to prepare for the class.					
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Continue to 応用システム理論(2)					

## 応用システム理論(2)

### [Course requirements]

linear programming, nonlinear programming

### [Evaluation methods and policy]

In principle, the grading will be based on the absolute and comprehensive evaluation of the reports on the subjects given in the class.

### [Textbooks]

Not used

No textbook is used.

Handouts will be provided during class.

### [References, etc.]

#### ( Reference books )

M. Fukushima: Introduction to Mathematical Programming (in Japanese), Asakura, 2011.

Y. Nishikawa, N. Sannomiya, and T. Ibaraki: Optimization (in Japanese), Iwanami, 1982.

M. Yagiura, and T. Ibaraki: Combinatorial Optimization ---With a Central Focus on Meta-heuristics--- (in Japanese), Asakura, 2001.

B. Korte, and J. Vygen: Combinatorial Optimization ---Theory and Algorithms, Sixth Edition, Springer, 2018.

M. Gendreau and J.-Y. Potvin (eds.): Handbook of Metaheuristics, Second Edition, Kluwer Academic Publishers, 2010.

K. Miettinen: Nonlinear Multiobjective Optimization, Kluwer Academic Publishers, 1999).

### [Study outside of class (preparation and review)]

Students are expected to review the class and try various methods by themselves.

### ( Other information (office hours, etc.) )

Handouts and exercises are given in the class.

\* Please visit KULASIS to find out about office hours.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG10 5C610 LJ72				
<b>Course title (and course title in English)</b>	電磁気学特論 Electromagnetic Theory, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUO TETSUJI Graduate School of Engineering Senior Lecturer, MIFUNE TAKESHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<p>The first half: the special theory of relativity and the covariance of Maxwell's equations</p> <p>The latter half: theory and methods of computational electromagnetics</p>					
<b>[Course objectives]</b>					
<p>1. Understanding of the basic concepts of special theory of relativity and the covariant formulation of Maxwell's equations</p> <p>2. Understanding of the basics of computational electromagnetics</p>					
<b>[Course schedule and contents]</b>					
<p>Introduction to special theory of relativity: 2-3times</p> <ul style="list-style-type: none"> <li>- Galilean relativity and special relativity</li> <li>- Lorentz transformation</li> </ul> <p>Tensor representation and relativistic dynamics: 2-3times</p> <ul style="list-style-type: none"> <li>- Introduction to tensor representation</li> <li>- Relativistic dynamics</li> </ul> <p>Covariant formulation of Maxwell's equations: 2-3times</p> <ul style="list-style-type: none"> <li>- Electromagnetic field tensor</li> <li>- Lorentz covariance of Maxwell's equations</li> </ul> <p>Foundations of computational electromagnetics: 1-2times</p> <ul style="list-style-type: none"> <li>- Introduction to computational electromagnetics</li> </ul> <p>Theory and methods in computational electromagnetics: 3-4times</p> <ul style="list-style-type: none"> <li>- Methods in computational electromagnetics, e.g., finite element method</li> </ul> <p>Matrix computations in computational electromagnetics: 1-2times</p> <ul style="list-style-type: none"> <li>- Basics and state-of-the-art of matrix computations in computational electromagnetics</li> </ul>					
<b>[Course requirements]</b>					
Basic electromagnetic theory					
<b>[Evaluation methods and policy]</b>					
Submission of reports (twice)					
<p style="text-align: right;">Continue to 電磁気学特論(2)</p>					

## 電磁気学特論(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Y. Kazama, Introductory Lectures on the Theory of Relativity (in Japanese), Baifukan, 1997.

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG10 5C611 LE72				
<b>Course title (and course title in English)</b>	電磁界シミュレーション Computer Simulation of Electrodynamics		<b>Instructor's name, job title, and department of affiliation</b>	Research Institute for Sustainable Humanosphere Professor, OOMURA YOSHIHARU Research Institute for Sustainable Humanosphere Associate Professor, EBIHARA YUUSUKE	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Variables and Classification of Simulation Codes, 1time, Finite Difference Methods, 1time, Difference Form of Maxwell's Equation and Grid Assignment / Time Step Chart, 1time, Courant Condition, 1time, Electromagnetic Radiation from a Thin Current, 1time, Buneman-Boris Method for Equation of Motion (Relativistic Eqs.), 1time, Interpolation of Electromagnetic Field, 1time, Computation of Charge and Current Densities, Self-force Cancellation, 1time, Initialization of Particles and Fields, 1time, Renormalization and Diagnostics, 1time, Advection/Wave Equation for 1D Case (FTCS, Lax, Upwind and Lax-Wendroff Methods), 1time, von Neumann Stability Analysis, 1time, Limiter Function, 1time, Advection/Wave Equation for Multi-Dimensional Case, 1time, Vlasov Equation, 1time,					
<b>[Course requirements]</b>					
Electrodynamics, Vector Analysis, Computer Language					
<b>[Evaluation methods and policy]</b>					
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Continue to 電磁界シミュレーション(2)					

## 電磁界シミュレーション(2)

### [Textbooks]

### [References, etc.]

#### ( Reference books )

(1) H. Matsumoto and Y. Omura, Computer Space Plasma Physics: Simulation Techniques and Softwares, Terra Scientific, Tokyo, 1993. (2) H. Usui and Y. Omura, Advanced Methods for Space Simulations, Terra Pub, 2007.

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG10 5C612 LB72			
<b>Course title (and course title in English)</b>	宇宙電波工学 Space Radio Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Research Institute for Sustainable Humanosphere Professor, KOJIMA HIROTSUGU Research Institute for Sustainable Humanosphere Associate Professor, KURITA SATOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
The present lecture provides the guideline how the technology on the electronics is used in spacecraft and space systems. In particular, we give how space environments affect spacecraft design in the view points of radiations, and spacecraft charging. The lecture also covers the design of onboard components such as power, communication, and attitude control systems.					
<b>[Course objectives]</b>					
Mastery of the way how we can make use of the knowledges of the physics and technology to the space engineering.					
<b>[Course schedule and contents]</b>					
Introduction: Development of spacecraft and their launches(1lecture) Space environment(2 lectures) Spacecraft charging(2 lectures) Radiation effects to spacecraft designs (1 lecture) Power system of spacecraft (1 lecture) Electromagnetic Compatibility in spacecraft (1 lecture) Thermal design of spacecraft (2lectures) Telecommunication (2 lectures) Attitude control of spacecraft (1 lecture) History of the development of rockets (1 lecture)					
<b>[Course requirements]</b>					
Plasma physics, Electromagnetics. Radio engineering, Electronics					
<b>[Evaluation methods and policy]</b>					
11 times or more attendances in lectures are mandatory. The grade is evaluated considering the attendance and the final examination. The ratio for the evaluation is 4:6. (In the case of full on-line lectures, the policy might change. Details will be given in the first lecture).					
Continue to 宇宙電波工学(2)					

## 宇宙電波工学(2)

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### [Textbooks]

Not used

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Review the notes that are taken during the lecture.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG10 5C613 LB72				
<b>Course title (and course title in English)</b>	超伝導工学 Superconductivity Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Program-Specific Professor, NAKAMURA TAKETSUNE Graduate School of Engineering Professor, AMEMIYA NAOYUKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
See Japanese version					
<b>[Course objectives]</b>					
See Japanese version					
<b>[Course schedule and contents]</b>					
This class is in English.					
<p>以下の各項目について講述する。各項目には、履修者の理解の程度を確認しながら、【】で指示した週数を充てる。各項目・小項目の講義の順序、それぞれに充てる講義週数は固定したものではなく、担当者の講義方針と履修者の背景や理解の状況に応じて、講義担当者が適切に決める。全15回の講義の進め方については適宜、指示をして、履修者が予習をできるように十分配慮する。講義は基本的に英語で行う。シラバスにある日本語のテクニカルタームなどに対応する英語について予習しておくことを期待する。</p> <p>(1) 序論 (Introduction) 【1週】 (Introduction) : 超伝導工学を学ぶ上で理解しておくべき背景を概説する。</p> <p>(2) 超伝導現象の基礎 (Basics of superconducting phenomena) 【3～4週】 : 超伝導体の基礎的物理現象について、量子論や熱力学を使って講述する。</p> <p>(3) 応用の基礎となる超伝導特性 (Superconducting properties as basis of applications) 【2～3週】 : 超伝導体の具体的応用を考える上で必要な物理現象 (例えば磁束ピン止め現象など) を概説する。</p> <p>(4) 第二種超伝導体の電磁特性 (Electromagnetic phenomena in type II superconductor) 【1週】 : 磁気的不安定性、交流損失、常伝導転移などについて理解するために必要な第二種超伝導体の電磁特性 (混合状態と臨界状態モデル、臨界電流と磁束フロー) について講述する。</p> <p>(5) 磁気的不安定性 (Thermomagnetic instability) 【1週】 : 第二種超伝導体における基礎的な電磁現象であり、実用上も注意が必要な磁気的不安定性について講述する。</p> <p>(6) ヒステリシス損失 (Hysteresis loss of superconductor) 【1週】 : 超伝導体は交流で使ったときに発生する損失のうちでも代表的なヒステリシス損失について、モノリシック超伝導体を対象に発生機構と定量的表式について講述する。</p>					
Continue to 超伝導工学(2)					

## 超伝導工学(2)

( 7 ) 多心線の電磁現象 ( Electromagnetic phenomena in multifilament superconductor ) 【 2 週 】 :  
磁気的不安定性抑制やヒステリシス損失低減のために多心化された超伝導線の電磁現象について講述する。具体的には、多心化によるヒステリシス損失低減、フィラメント間の電磁的結合と結合時定数、結合損失などについて講述する。

( 8 ) 超伝導ケーブル ( 集合導体 ) の電磁現象 ( Electromagnetic phenomena in superconducting cable (assemble conductors) ) 【 0 . 5 週 】 :  
大電流化のために多心線や単心線を集合化した超伝導ケーブル ( 集合導体 ) では、ひとつ大きな空間スケールでの電磁現象が発現するので、これについて講述する。

( 9 ) 超伝導線のクエンチと保護 ( Quench / thermal runaway of superconductor and protection ) 【 1 . 5 週 】 :  
極低温で使用する超伝導体に常伝導部が発生したときの振る舞いと、超伝導安定性・保護の考え方について講述する。

( 10 ) 演習・フィードバック【 1 週 】 :  
受講者の理解度を深めるため、適時、演習やフィードバックを実施する。

受講者の興味と時間的余裕次第では、以下の項目についても講義する。

( 11 ) 超伝導体の電磁現象の数値解析 ( Numerical electromagnetic field analysis of superconductor ) :  
超伝導体の交流損失の評価のために有効な数値解析について紹介する。

### [Course requirements]

None

### [Evaluation methods and policy]

Examination and report

### [Textbooks]

Not used

### [References, etc.]

( Reference books )  
電気学会 『超伝導工学』

### [Study outside of class (preparation and review)]

Electromagnetism  
Quantum dynamics

Continue to 超伝導工学(3)



超伝導工学(3)

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG10 5C617 LJ72				
<b>Course title (and course title in English)</b>	マイクロ波応用工学 Applied Microwave Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Research Institute for Sustainable Humanosphere Professor,SHINOHARA NAOKI Research Institute for Sustainable Humanosphere Associate Professor,MITANI TOMOHIKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This lecture picks up microwave power transmission (MPT) technology, rectifying antenna (rectenna), antenna and propagation for the MPT, microwave transmitters, and some MPT applications like the Space Solar Power Satellite/Station. This lecture also picks up the other wireless power transmission technologies like resonance coupling, energy harvesting, and applied microwave technologies of microwave processing, wireless communications, and radar.					
<b>[Course objectives]</b>					
Students learn about applied microwave engineering, mainly microwave power transmission.					
<b>[Course schedule and contents]</b>					
Introduction,1time,The purpose and constitution of the lecture, and review of microwave engineering are explained. Applications of Wireless Power Transmission,3-4times,Space Solar Power Satellite/Station and Ubiquitous power source as applications of microwave power transmission, the resonance coupling and energy harvesting as the other battery-less technologies are explained. rectifying antenna (rectenna),1-2times,rectifying antenna (rectenna) for the MPT are explained. antenna and propagation for the MPT,5-6times,Calculation of beam collection efficiency and beam propagation with FDTD method are explained. Phased array technologies, beam targetting method, non linear physics of microwave-plasma interaction are overviwed. Microwave transmitters,2times,High efficient semi-conductor amplifiers and microwave tubes are explained. microwave processing, wireless communications, and radar,2times,Microwave processing, wireless communications, and radar texhnologies are explained. The order of instruction for each topic and subtopic may vary, and the course instructors will organize the lectures as appropriate for the students. Students will be informed of the lecture plan (for all 15 lectures) in advance and will have sufficient time for preparation.					
<b>[Course requirements]</b>					
Microwave engineering					
<b>[Evaluation methods and policy]</b>					
Reports					
<b>[Textbooks]</b>					
Naoki Shinohara 『Solar Power Satellite (in Japanese), 』 ( Ohm Publishing ) ISBN:978-4-274-21233-8					
----- Continue to マイクロ波応用工学(2) -----					

## マイクロ波応用工学(2)

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### [References, etc.]

#### ( Reference books )

Naoki Shinohara 『Wireless Power Transfer via Radiowaves』 ( Wiley - ISTE ) ISBN:978-1-84821-605-1

### [Study outside of class (preparation and review)]

A student should read text book before/after class.

### ( Other information (office hours, etc.) )

Number of the lectures may change.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG10 5C625 LB72					
<b>Course title (and course title in English)</b>	電気回路特論 Theory of Electric Circuits, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, HISAKADO TAKASHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
Introduction, 1time, Modeling by circuit, 4times, Circuit equation, 4times, Phenomena in circuit, 3times, Property of circuit, 2times, Achievement test, 1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Reports						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG10 6C627 PB72				
<b>Course title (and course title in English)</b>	研究インターンシップM (電気) Research Internship(M)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, DOI SHINJI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG10 5C628 LB72				
<b>Course title (and course title in English)</b>	状態方程式論 State Space Theory of Dynamical Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI Graduate School of Engineering Senior Lecturer,HOSOE YOUHEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
The course deals with the dynamical system theory based on linear time-invariant state equations. It covers such topics as state equations, controllability and observability, mode decomposition and its relevance to controllability/observability, stability of dynamical systems, and the Kalman canonical decomposition.					
<b>[Course objectives]</b>					
To acquire the knowledge on the basic theory for linear system analysis by means of state equations. To have sufficient understanding required for further studies on control system design with state equations.					
<b>[Course schedule and contents]</b>					
Feedback systems and state equations (3-4 weeks)					
Fundamentals of state equations, their relationship to transfer functions and block diagram representations.					
Responses of linear systems (5-6 weeks)					
State transition matrices, equivalence transformation of systems, mode decomposition, and Lyapunov stability.					
Controllability and observability (5-6 weeks)					
Controllability and observability, mode decomposition and its relevance to controllability/observability, controllable subspace and unobservable subspace, and the Kalman canonical decomposition. Checking degrees of understanding of all the lecture topics closes the class.					
<b>[Course requirements]</b>					
Classical control theory (in terms of transfer functions), linear algebra and calculus.					
<b>[Evaluation methods and policy]</b>					
The grading will be based on the exam.					
Continue to 状態方程式論(2)					

## 狀態方程式論(2)

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### [Textbooks]

Handouts will be given at the class.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Review using lecture notes and the handouts is presupposed on a regular basis.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG10 5C631 LB72				
<b>Course title (and course title in English)</b>	制御系設計理論 Design of Control Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI Graduate School of Engineering Senior Lecturer,HOSOE YOUHEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The course is based on State Space Theory of Dynamical Systems, and provides the applications of the concepts given therein to systematic control system design. The course covers such topics as state feedback and pole assignment, observers, synthesis of feedback control systems, servo conditions and feedforward, and optimal control under quadratic performance indices.					
<b>[Course objectives]</b>					
To understand the basic ideas of control system design based on state space representations, and acquire fundamental knowledge and skills on practical control system design through simulated experiences with the report subjects.					
<b>[Course schedule and contents]</b>					
Pole assignment by state feedback (4-5 weeks)					
State feedback, controllable canonical forms and pole assignment of scalar/multivariable systems, computation of the state feedback gains for pole assignment, transient responses, uncontrollable poles and stabilizability.					
Observers (3-4 weeks)					
Observable canonical forms and observability conditions, full-order observer, minimal-order observer, conditions for observers and observer-based feedback.					
Synthesis of feedback systems (2-3 weeks)					
Feedback systems with integral compensation, servo systems, internal model principle, synthesis of servo systems.					
Optimal control under quadratic performance index (3-4 weeks)					
Optimal regulators and their closed-loop poles, Riccati equations and their solutions, relationship with the pole assignment problem. Checking degrees of understanding of all the lecture topics closes the class.					
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Continue to 制御系設計理論(2)					



## 制御系設計理論(2)

### [Course requirements]

The contents given in State Space Theory of Dynamical Systems, and linear algebra.

### [Evaluation methods and policy]

In principle, the grading will be based on the absolute and comprehensive evaluation of the reports on the subjects given in the class. Should this change due to inadequate efforts on the submitted reports, an exam might be also imposed, in which case the details will be announced at the class at least two weeks before the exam term.

### [Textbooks]

Handouts will be given at the class.

### [References, etc.]

( Reference books )

( Related URLs )

((Info) <http://www-lab22.kuee.kyoto-u.ac.jp/~hagiwara/ku/matlab-octave.html>)

### [Study outside of class (preparation and review)]

Review using lecture notes and the handouts is presupposed on a regular basis.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG10 6C643 SB72					
<b>Course title (and course title in English)</b>	電気工学特別実験及演習 1 Advanced Experiments and Exercises in Electrical Engineering I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, DOI SHINJI Graduate School of Engineering KANKEI KYOIN		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,30times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG10 6C646 SB72				
<b>Course title (and course title in English)</b>	電気工学特別実験及演習 2 Advanced Experiments and Exercises in Electrical Engineering II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, DOI SHINJI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG10 5C647 LJ72				
<b>Course title (and course title in English)</b>	電気電磁回路論 Electrical and Electromagnetic Circuits		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, WADA OSAMI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Guidance, 1time, Circuit description including electromagnetic coupling effects, 2times, Evaluation and description methods for high-frequency circuits, 2times, Transmission line and its characteristics (1) , 2times, Transmission line and its characteristics (2) , 2times, Description of electromagnetic couplings, 2times, E-system integrity design technology for electric and electronic systems, 3times, Final exam and feedback, 1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
Materials for this course will be distributed at the lectures.					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG10 5C718 PJ72				
<b>Course title (and course title in English)</b>	電気工学特別研修 1 (インターン) Advanced Seminar in Electrical EngineeringI		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, DOI SHINJI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3,4,Fri.3,4	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,6times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG10 5C720 PJ72				
<b>Course title (and course title in English)</b>	電気工学特別研修 2 (インターン) Advanced Seminar in Electrical EngineeringII		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,DOI SHINJI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3,4,Fri.3,4	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,6times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 5C800 LB52				
<b>Course title (and course title in English)</b>	半導体ナノスピントロニクス Semiconductor Nanospintronics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SHIRAISHI MASASHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
Spintronics is now attracting tremendous attention, and is recognized as one of the most potential candidates to overcome the limit of the Moore's law. Spintronics possesses attractive and profound basis physics and also a potential to practical applications towards MRAMs and spin FETs. In this lecture, I introduce some important and basic theories and experimental techniques in spintronics using semiconductors, metals, insulators, oxides and so on.					
<b>[Course objectives]</b>					
Understanding basic physics of spin transport, spin current and spin-orbit coupling. Mastering calculation skills related with these topics.					
<b>[Course schedule and contents]</b>					
<p>Introduction,1time,Spin is a quantum quantity, and thus it is to induced by rotation of an electron (an electron is an elementary particle, i.e., it has no domain. Thus, rotation of an electron cannot be defined). Nevertheless, the spin degree of freedom can be coupled to spatial rotation because spin is a generator of infinitesimal rotation. I explain the essence of spin, its SU(2) algebra and so on.</p> <p>Relativistic quantum physics and spin-orbit interaction,5times,To understand spin manipulation and spin coherence in semiconductor, it is quite important what the spin-orbit interaction (SOI) is. The SOI is a manifestation of a relativistic effect, and the Dirac equation, the equation of motion in relativistic quantum physics, is derived to understand the SOI. Next, the SOI is explicitly derived be expanding the Dirac equation. As a related important topic, electron motion in graphene, which can be described as massless Dirac fermion, and the Berry phase (a geometric phase that plays an important role in spintronics) of electrons in graphene are discussed.</p> <p>Electrical and dynamical spin injection into condensed matters and generation of pure spin current ,5-6times, Pure spin current is a quite significant physical current in spintronics using semiconductors and so on. Pure spin current is a current of only a spin degree of freedom without a net charge flow. I introduced some important papers and show how to derive essential equations describing generation and propagation of pure spin current. (1) Spin drift-diffusion equation, (2) Hanle-type spin precession, (3) spin pumping using magnetization dynamics, and (4) spin current circuit theory are discussed.</p> <p>Recent topics in spintronics,2-3times,Topological insulators and the Berry phase are important topics in modern spintronics. To understand the essence of them, I show the derivation of the Kubo formula, and the calculation of the Hall conductivity based on the Kubo theory. The above mentioned topics are the main contents of this lecture, but I may add or omit some topics as requests from students.</p>					
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Continue to 半導体ナノスピントロニクス(2)					

## 半導体ナノスピントロニクス(2)

### [Course requirements]

Solid State Physics and Quantum Physics at the level of undergraduate school.

### [Evaluation methods and policy]

Report submission

### [Textbooks]

None

### [References, etc.]

#### ( Reference books )

For foreign students, I recommend the following review articles: 1. Spin Hall effect, J. Sinova et al., Rev. Mod. Phys. 87, 1213 (2015). 2. Spintronics: Fundamentals and applications, I. Zutic et al., Rev. Mod. Phys. 76, 1 (2004). 3. Nonlocal magnetization dynamics in ferromagnetic heterostructures, Y. Tserkovnyak et al., Rev. Mod. Phys. 77, 1375 (2005).

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG10 7K010 SE72 G-ENG11 7K010 SE72				
<b>Course title (and course title in English)</b>	先端電気電子工学通論 Recent Advances in Electrical and Electronic Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, KANEKO KENTAROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The class consists of a series of seminars at 3 laboratories related to Department of Electrical and Electronic Engineering (energy and electrical machinery, computers, control and systems, communications and radio engineering, and electronic devices and applied physics). Each seminar intends to give a brief introduction into a specific research field so that students can get a feel for the state-of-the-art in each topic and broaden their scope beyond their majors.					
<b>[Course objectives]</b>					
Students can understand the research contents of other laboratories and acquire a wide range of academic knowledge in electrical and electronic engineering.					
<b>[Course schedule and contents]</b>					
,6times, ,9times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
The evaluation of a student`s work is given based on his/her attendance, reports and discussions, not on examinations.					
<b>[Textbooks]</b>					
None					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
Check the research contents of each laboratory in advance and select the laboratory you want to attend.					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG40 7R610 SB72				
<b>Course title (and course title in English)</b>	電気工学特別セミナー Advanced Electrical Engineering Seminar		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, DOI SHINJI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG40 7R630 PB72				
<b>Course title (and course title in English)</b>	研究インターンシップD (電気) Research Internship (D)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, DOI SHINJI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG40 7R632 SB72				
<b>Course title (and course title in English)</b>	電気工学特別演習1 Advanced Exercises on Electrical Engineering I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, DOI SHINJI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG40 7R633 SB72				
<b>Course title (and course title in English)</b>	電気工学特別演習2 Advanced Exercises on Electrical Engineering II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, DOI SHINJI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 6C710 SB72				
<b>Course title (and course title in English)</b>	電子工学特別実験及演習 1 Advanced Experiments and Exercises in Electronic Science and Engineering I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 6C713 SB72				
<b>Course title (and course title in English)</b>	電子工学特別実験及演習 2 Advanced Experiments and Exercises in Electronic Science and Engineering II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 5C801 LJ72				
<b>Course title (and course title in English)</b>	電子装置特論 Charged Particle Beam Apparatus		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, GOTOU YASUHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Fundamental technologies of an ion beam system, such as ion sources, formation and evaluation of ion beams, transport of ion beams, and ion-solid interaction will be presented. Taking ion implantation as one of the example of the ion beam application, the relationship between the incident ion energy and implantation depth will be presented. Each element of a typical ion beam system is explained in detail.					
<b>[Course objectives]</b>					
To understand the details of an ion beam apparatus: generation, transport and evaluation of an ion beam. Understanding of the entire ion beam apparatus as a system is also purpose of the class.					
<b>[Course schedule and contents]</b>					
<p>[Ion beam systems and their applications] Once Outline of the class is presented. Physical properties of ions in vacuum are given, and ion beam apparatuses and their application will be introduced with some typical examples.</p> <p>[Ion-solid interaction] 3 times Interaction between high energy ion and solid atoms are given. Major topics are: how the ions transfer their energy to the target atoms, i.e., how the ions are decelerated in the solid, and relationship between incident ion energy and implantation depth is given. Concept of sputtering phenomenon is also presented.</p> <p>[Nature of ion beam] Once Concept of the acceleration voltage is introduced to explain the principle of the ion beam systems. Nature of an ion beam is also presented.</p> <p>[Generation and transport of ion beam] 3 times Methods of ion generation for various elements are explained. Important equations of beam extraction and beam transport are given. Starting with the paraxial ray equation, concept of transfer matrix is given. Finally, some important physical parameters of ion beams are given.</p> <p>[Mass separators and energy analyzers] 4 times Details of magnetic sector as mass separator are given. Transfer matrix of the mass separator are presented and focusing effect is described. An important parameter of mass resolution is given. Some different kinds of energy analyzers are also introduced. Deflection and detection systems and the methods to evaluate the current of the ion beam are also introduced.</p> <p>[Fundamentals of vacuum engineering] Once Fundamentals of vacuum engineering is given. Several pumps used for ion beam systems are also introduced.</p>					
Continue to 電子装置特論(2)					



## 電子装置特論(2)

[Design of ion beam systems] Once  
Design of an ion beam system under a given condition will be presented.

[Feedback] Once

### [Course requirements]

Vacuum Electronic Engineering (undergraduate course)

### [Evaluation methods and policy]

Grading will be made with the results of the term-end examination. Achievements of exercises in the class are also taken into consideration.

### [Textbooks]

Instructed during class

### [References, etc.]

( **Reference books** )  
Zyunzo Ishikawa 『Charged Particle Beams』 ( Corona ) ISBN:978-4-339-00734-3

### [Study outside of class (preparation and review)]

After the class is over, confirm your understanding with the practices listed on the textbook.

### ( **Other information (office hours, etc.)** )

We will have brief practice in each class. Bring your calculator and A4-size writing papers.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG11 5C803 LB72			
<b>Course title (and course title in English)</b>	量子情報科学 Quantum Information Science		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKEUCHI SHIGEKI Graduate School of Engineering Associate Professor, OKAMOTO RYOUN Graduate School of Engineering Associate Professor, ETO YUJIRO Graduate School of Engineering Assistant Professor, TAKASHIMA HIDEAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
An overview of the quantum information sciences will be given. The topics includes the basic picture of wave/particle duality, quantum key distribution, quantum computation, quantum communication, quantum measurements.					
<b>[Course objectives]</b>					
To understand the basic concepts/mechanisms of quantum key distribution, quantum computers, and quantum metrology so that one can read and understand the scientific papers of the related area.					
<b>[Course schedule and contents]</b>					
<p>Introduction, 3 times, First, we outline the whole lecture and then explain basic concepts such as quantum bit, quantum gate, quantum entanglement etc.</p> <p>Quantum Computer (Theory), 3 times, On quantum computation, various quantum algorithms are discussed.</p> <p>Quantum Computer (Experiment), 3 times, Quantum information processing is being studied in various physical systems such as photon, ion trap, nuclear spin and the like. We will explain how to realize them.</p> <p>Quantum Key distribution and Quantum metrology, 4 times, Describe the basic concept of quantum cryptography and quantum measurements and their recent research trends.</p> <p>Summary and Outlook, 2 times, In addition to summarizing the whole, if time permits, discuss the problems of quantum information science and ethics.</p>					
<b>[Course requirements]</b>					
Basic understanding of quantum mechanics will be helpful.					
<b>[Evaluation methods and policy]</b>					
Comprehensive evaluation based on normal points (25 points) and reports (3 times, 25 points each).					
<p>• <u>In principle, if you miss four or more classes, you will be rejected.</u></p> <p style="text-align: right;">Continue to 量子情報科学(2)</p>					

## 量子情報科学(2)

- Reports must be submitted all times.

Give high points for those that show their own ingenuity.

Note that as a result of the comprehensive evaluation, there may be the case that you fail to earn the credits even when you submit all the reports and attend all the classes.

### [Textbooks]

No text book will be used.

### [References, etc.]

#### ( Reference books )

Nielsen & Chuang, Quantum Computation and Quantum Information, Cambridge University Press

Shigeki Takeuchi, Quantum Computer, Kodansha (in Japanese)

### [Study outside of class (preparation and review)]

The reports are mandatory.

### ( Other information (office hours, etc.) )

We welcome your positive questions and comments. We select the language (Japanese or English) used in the lecture taking into account the situation and hope of the students taking this lecture.

Depending on the situation of COVID-19, there is a possibility that the lecture will be given online.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG11 5C810 LJ72				
<b>Course title (and course title in English)</b>	半導体工学特論 Semiconductor Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course explores the fundamentals of semiconductor physics and engineering, which are essential to understand semiconductor materials and devices.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
<p>Band theory, 2-3 times, Electronic band structures are discussed. Nearly free electron and tight-binding approaches are explained. Band structures of major semiconductors such as Si and GaAs are also discussed. Carrier transport and scattering, 3-4 times, Carrier transport and electrical conduction are explained by using the Boltzmann transport equation. Scattering mechanism of carriers and mobility are discussed.</p> <p>High-field effect, 2-3 times, Drift of carriers and junction breakdown under high electric field are discussed. A few phenomena under high magnetic field are also explained.</p> <p>Defects in semiconductors, 1-2 times, Crystallographic and electronic properties of defects (both extended and point defects) in a semiconductor are explained.</p> <p>MOS physics, 2-3 times, Energy band diagrams and carrier statistics in a metal/insulator/semiconductor (MIS) structure are discussed.</p>					
<b>[Course requirements]</b>					
Semiconductor engineering, quantum mechanics (undergraduate level)					
<b>[Evaluation methods and policy]</b>					
Final examination and a few reports					
<b>[Textbooks]</b>					
No textbook is assigned.					
<b>[References, etc.]</b>					
<p>( <b>Reference books</b> )</p> <p>S. M. Sze Physics of Semiconductor Devices (Wiley Interscience) P.Y. Yu and M. Cardona Fundamentals of Semiconductors (Springer)</p>					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 5C813 LJ72				
<b>Course title (and course title in English)</b>	電子材料学特論 Electronic Materials, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Fundamentals and recent progress in semiconductor materials and various advanced devices are explained.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Si semiconductor, 3-4 times, Bulk growth, wafering, defect engineering, and impurity gettering of Si are reviewed. Silicon-On-Insulator (SOI) is also explained. Advanced CMOS devices and materials, 2-3 times, Basic structures and performance enhancement of advanced CMOS devices, the core devices in LSI, are explained. High-frequency devices and materials, 2-3 times, Structure and operation principle of high-frequency devices are explained. Semiconductor materials suitable for high-frequency applications are discussed. Power devices and materials, 2-3 times, Structure and operation principle of power devices are explained. Semiconductor materials suitable for power conversion applications are discussed.					
<b>[Course requirements]</b>					
Basics of solid state physics and semiconductor engineering					
<b>[Evaluation methods and policy]</b>					
Report evaluation, taking account of lecture attendance					
<b>[Textbooks]</b>					
No textbook is assigned.					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 5C819 LB72				
<b>Course title (and course title in English)</b>	表面電子物性工学 Surface Electronic Properties		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KOBAYASHI KEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<p>[Course outline] The course explains the structures and the electronic states of solid surfaces which are the microscopic origins of the electrical and the optical properties at surfaces and/or interfaces. It also explains the mesoscopic quantum phenomena related to the surfaces.</p>					
<b>[Course objectives]</b>					
<p>[Course goals] The course specific goals are to understand a wide variety of the properties of surfaces as the two-dimensional borders of three-dimensional bulk materials and to learn electronic materials from the point of view of surface science.</p>					
<b>[Course schedule and contents]</b>					
<p>[Course Plan] Background of surface studies (2) The lecture covers the following topics: History of surface science, Surface phenomena in a variety of science and engineering fields, Development of semiconductor devices, Nanometer-scale science of surfaces, Definition of surfaces and interfaces.</p> <p>Spatial structures and electronic structures (3) The lecture covers the following topics: Surface spatial structures, Two-dimensional Bravais lattices, Surface relaxation and reconstruction, Surface morphology, Electronic structures in solids, Tight binding model, Surface electronic structures.</p> <p>Quantum states of atoms and electrons (4) The lecture covers the following topics: Quantum mechanical description of atoms and electrons, Mixing and hybridization of atomic orbitals, Relationship between surface structures and electronic states.</p> <p>Electronic states in surface reconstruction (2) The lecture covers the following topics: Surface Reconstruction of semiconductors (Si, GaAs), Surface dimerization, Modification of surface atom orbitals, Charge transfer between surface atoms.</p> <p>Mesoscopic phenomena and low-dimensional materials (3) The lecture covers the following topics: Electronic properties of low-dimensional materials, Single electron tunneling, Quantized conductance, Two-dimensional materials, Carbon nanotubes, Graphene.</p> <p>Final check for the understanding of the course (1)</p>					
<div style="text-align: right;">Continue to 表面電子物性工学(2)</div>					

## 表面電子物性工学(2)

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### [Course requirements]

Basics of solid state physics.

### [Evaluation methods and policy]

Evaluation is based on three or four reports assigned in lectures.

### [Textbooks]

Handouts will be distributed for some of the lectures.

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

The lecture content must be well reviewed.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG11 6C821 PB72				
<b>Course title (and course title in English)</b>	研究インターンシップM ( 電子 ) Research Internship(M)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG11 5C822 LJ72				
<b>Course title (and course title in English)</b>	光物性工学 Optical Properties and Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAWAKAMI YOUICHI Graduate School of Engineering Associate Professor, FUNATO MITSURU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2-3回times, ,7-8回times, ,4-5回times, ,1回times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 5C825 LJ72				
<b>Course title (and course title in English)</b>	量子論電子工学 Quantum Theory for Electronics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KAKEYA ITSUHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Based on the fundamental understanding of quantum mechanics, we start with hydrogen atom of 1 atom and 1 hydrogen atom, hydrogen molecule ion of 2 atom electrons, hydrogen molecule of 2 atom 2 electrons, 1 electron Lecture on how to calculate the electronic state when increasing the number from the next step. We will also talk about molecular models consisting of a plurality of atoms. In order to understand fundamental handling in the case of multi electron system, consider Coulomb interaction, spin orbit interaction, as an interaction received by electrons. Simultaneously, we give an approximate calculation method necessary for these calculations.					
<b>[Course objectives]</b>					
Based on the fundamental understanding of quantum mechanics, we acquire knowledge and thinking to the extent that approximate calculation can be performed on a simple problem. In addition, we will acquire academic ability to read only specialized books such as solid state electronics based on quantum theory.					
<b>[Course schedule and contents]</b>					
Review and supplement of quantum mechanics (1 time) Review the quantum mechanics learned at undergraduate and repair notation method to learn from now.					
Approximation method (2 times) Perturbation method, perturbation method when degenerate, time dependent perturbation method, variational method, learn while solving exercises. The approximation method learned here becomes the basis of the calculation concerning the contents of the subsequent lecture.					
Combined with angular momentum (2 times) We describe the angular momentum necessary for understanding the electronic level and its composition.					
Spin orbit interaction (1 time) Understanding the spin orbit interaction is essential for understanding the details of the electronic level of multiple electron atoms and the electronic level in solids. Here, I will give lectures and descriptions of spin orbit interactions and explain quantitative handling methods. Explain calculation by perturbation method and calculation by diagonal method.					
Multiplet (1 time) I will give a lecture on the electronic level of multiple electron atoms. In particular, we will clarify the origin of microstructure and understand how electron level is split by Coulomb interaction, spin orbit interaction, its magnitude and number of divisions. In addition, we describe empirical Hund's law concerning the ground state of such multi - electron atoms.					
Continue to 量子論電子工学(2)					

## 量子論電子工学(2)

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### Zeeman effect (2 times)

The shift of the electronic level in the magnetic field or Zeeman splitting will be explained by calculation by the perturbation method. Abnormal Zeeman effect when the magnetic field is weak, normal Zeeman effect, Paschen back effect in case of strong, handling of spin orbit interaction will be discussed.

### Hartree-Fock equation (2 times)

We describe the calculation of electronic levels of multi-electron atoms about the Hartley method, the Hartley-Fock method, and the Hartree-Fock-Slater method by mean field self-consistent method.

### Molecular model (2 times)

In the case of bimolecular molecules, we will explain the valence bonding method and the molecular orbital method, and explain the hydrogen level, the electronic level of hydrogen molecule, that is, the binding energy and the bonding distance. Also, we will talk about the type of molecular bond and hybrid trajectory.

### Crystal field and magnetism (2 times)

The electron orbit of the atom in the crystal will be explained from the crystal electric field. In addition, we introduce Heisenberg's effective Hamiltonian and outline the paramagnetism and electronic correlation of the substance.

## [Course requirements]

Basics of quantum mechanics (Schrodinger equation, one dimensional potential problem, concept of expectation, etc.)

## [Evaluation methods and policy]

Examination and report

## [Textbooks]

Instructed during class

## [References, etc.]

### ( Reference books )

Introduced during class

## [Study outside of class (preparation and review)]

Please do exercises voluntarily

## ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG11 5C828 LJ72			
<b>Course title (and course title in English)</b>	光量子デバイス工学 Quantum Optoelectronics Devices		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,NODA SUSUMU Graduate School of Engineering Associate Professor,ASANO TAKASHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course explains a method for systematic analysis of the interaction between light and electrons, and how to control the interaction. First, we explain the density matrix as a method to treat the time evolution of a quantum system including the relaxation process due to the interaction with the external environment. In addition to calculating the optical response of a simplified electronic system and determining the optical absorption coefficient and gain, we show how to calculate the second harmonic generation and two-photon absorption. Next, we explain the band structure and density of states of the electron system in a semiconductor as a more realistic model, and explain that the absorption coefficient and gain can be controlled by controlling the quantum structure such as quantum wells. Furthermore, we will show that it is possible to control the interaction between light and electrons by controlling the photon system with microcavities, etc., and that it is possible to enhance the spontaneous emission rate and form electron-photon strong coupling states.					
<b>[Course objectives]</b>					
Students will learn how to calculate the optical absorption coefficient/gain and refractive index in quantum structures. Students also will understand the interaction between light and electrons, including nonlinear response. Students will understand how to control spontaneous emission.					
<b>[Course schedule and contents]</b>					
1. Introduction (1 time) The academic background of optical quantum device engineering is described.					
2-1. Methods for analyzing electron-photon interactions (4 times) After reviewing the basics of quantum mechanics, we discuss the interaction of light with two-level electron systems. We will discuss the necessity and derivation of density matrix theory, and show that it can represent both pure and mixed states. We also explain the difference between energy relaxation and pure phase relaxation in terms of the relaxation processes that can occur due to the interaction with the external environment, by deriving them from physical models. In this way, we derive a method to describe the time evolution of a quantum system including the relaxation process using a density matrix.					
2-2. Optical response of simplified electron systems (4 times) We explain how to derive the steady-state response of the density matrix describing the interaction between a two-level electron system and classical continuous wave light. We show how to calculate the complex permittivity, the absorption (gain) coefficient, and the change in refractive index from the linear response to the incident electric field. The higher-order responses to the incident optical field are also discussed, and the absorption and gain saturation are explained. Then, the electronic system is extended to three levels, and the principle and calculation method of optical nonlinear responses such as second harmonic generation,					
----- Continue to 光量子デバイス工学(2) -----					

## 光量子デバイス工学(2)

difference frequency generation, electro-optic effect, and two-photon absorption, which can occur only in electron systems with more than three levels, are explained.

### 3. Control of electronic systems and interaction of electrons and light (2.5 times)

The interaction between electrons and light in semiconductor quantum wells are explained. First, the band structure of bulk semiconductors and quantum wells are explained. Then, the calculation method of the complex permittivity by integration considering the density of states is described. After discussing the absorption spectra and polarization properties of the inter-subband transitions, the absorption spectra and polarization properties of the inter-band transitions are discussed.

### 4. Control of photons and electron-photon interaction (2.5 times)

We discuss control of spontaneous emission of light based on the control of photon states. First of all, the photonic system is described as a quantum state, and the system is treated as composite system of an interacting electron and photonic system, where its time evolution is described using a density matrix. Then, we derive the spontaneous emission rate of a two-level electron system in free space. Next, we discuss the enhancement of the spontaneous emission rate when a two-level electron system interacts with a single mode of a microcavity. We also discuss the physics of the strongly coupled electron-photon system.

### 5. Confirmation of learning achievement (1 time)

Confirmation of learning achievement

## [Course requirements]

None

## [Evaluation methods and policy]

Evaluations are made on the basis of reports.

## [Textbooks]

The lecture notes format is used in this course.

Other reference materials may be distributed and discussed as necessary.

## [References, etc.]

### ( Reference books )

Murray Sargent III, Marlan O. Scully, Willis E. Lamb, Jr. 『Laser Physics』 ( Westview Press ) ISBN: 9780201069037

## [Study outside of class (preparation and review)]

Nothing of note.

## ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

Continue to 光量子デバイス工学(3)

## 光量子デバイス工学(3)

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG11 5C830 LB72			
<b>Course title (and course title in English)</b>	量子計測工学 Quantum measurement		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, SUGIYAMA KAZUHIKO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
As an example of high precision measurements using quantum phenomena, frequency standards, which is realized with the smallest uncertainty in all measurement quantities at present, are discussed. The principle and evaluation of frequency standards are explained.					
<b>[Course objectives]</b>					
The goal of this lecture is to understand that precision measurements are realized with combination of the best technologies and is based on physics.					
<b>[Course schedule and contents]</b>					
<p>Introduction and principle of time measurement (1 time): Two principles of time measurement: Reproducibility postulate and dynamic model</p> <p>Fundamentals of atomic frequency standards (2.5 times): Atomic states, its energy shifts, high-resolution spectroscopy and high-sensitive detection</p> <p>Cesium frequency standard and atom interferometer (2.5 times): Principle of Ramsey resonance and its interpretation as atom interferometer</p> <p>Specification of frequency standards: evaluation methods and theoretical limit (2 times): Fundamentals of evaluation of frequency stability with Allan variance, and theoretical limit of frequency stability</p> <p>Noise (2 times): Incoherent signals and shot noise</p> <p>Relativistic theory and time (3 times): Impact of special and general relativistic theory on time measurement</p> <p>Others (1 time) If we have time, the frequency noises of masers and lasers, and other subjects will be lectured.</p> <p>Evaluation of understanding (1 time)</p>					
<b>[Course requirements]</b>					
<p>Fundamentals of physics (quantum physics, in particular) and electric circuits including linear system. The level which average graduate students of electric and electronic science and technology acquire is</p> <p style="text-align: right;"><b>Continue to 量子計測工学(2)</b></p>					

## 量子計測工学(2)

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sufficient.

### [Evaluation methods and policy]

Report(two times, at the first lecture and the after all lectures)

### [Textbooks]

Some materials will be provided in the case we need.

### [References, etc.]

#### ( Reference books )

C. Audoin and B. Guinot 『The Measurement of Time』 ( Cambridge University Press ) ISBN:0521003970  
( This is a nice book for this topic. I recommend anyone who are interested in this topic to buy one. )

Masao Kitano 『Basics of Electronics Circuit (in Japanese)』 ( Reimei ) ( This is a textbook used on the  
lectuer "Electronics" in fuculty. I will use this on the topic "Noise". )

#### ( Related URLs )

<https://panda.ecs.kyoto-u.ac.jp/portal/site/2022-210-C830-000>(The web page is located on Panda. If you  
cannot access the web page using the URL, please search it from <https://panda.ecs.kyoto-u.ac.jp/portal>)

### [Study outside of class (preparation and review)]

In case you need.

### ( Other information (office hours, etc.) )

Office of lecturer: A1-124

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG11 5C846 PJ72				
<b>Course title (and course title in English)</b>	電子工学特別研修 1 (インターン) Advanced Seminar in Electronic Science and Engineering I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3,4,Fri.3,4	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,6times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 5C848 PJ72				
<b>Course title (and course title in English)</b>	電子工学特別研修 2 (インターン) Advanced Seminar in Electronic Science and Engineering II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3,4,Fri.3,4	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,6times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG11 5C851 LJ72				
<b>Course title (and course title in English)</b>	電気伝導 Electrical Conduction in Condensed Matter		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KAKEYA ITSUHIRO Graduate School of Energy Science Professor, DOI TOSHIYA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
A fundamental aspect of the electrical conduction in solids is discoursed in terms of physics based on the classical dynamics and later on the quantum physics. An important concept of the phonon and the electron-phonon is discoursed, which play a very important role in the electrical conduction in solids. The electrical conductivity is discoursed with a frequency from 0, that is dc, to optical frequency, by which a unified understanding of electrical conduction and the optical property is intended.					
<b>[Course objectives]</b>					
This class is intended to bestow the understanding of the solid state physics of a level dealt in the celebrated textbook by Ashcroft and Mermin. It is also intended for those attending in this class to acquire an ability sufficient to strive through such a textbook by himself or herself after the class is completed.					
<b>[Course schedule and contents]</b>					
<p>Lattices and reciprocal lattices (2 classes) Explanation is made of lattices and reciprocal lattices, a fundamental item for understanding electron properties within an atom.</p> <p>Fundamentals of quantum mechanics, and the hydrogen atom model (2 classes) A simple review is made of quantum mechanics, and explication is made of electron states (energy, spatial distribution, etc.) within hydrogen and atoms other than hydrogen.</p> <p>Free-electron Fermi gas (3 classes) Explanation is made of the free-electron model as an ideal Fermi gas. Then, an overall explanation is provided of conductivity in metals, electronic specific heat, and the Hall effect.</p> <p>Energy bands (2 classes) The band structure of electron energy within a solid crystal is introduced, and explanation is provided of conductivity and the band structures of conductors, semiconductors, and insulators.</p> <p>Electron-phonon interactions, and conductivity in metals and semiconductors (2 classes) Lattice vibration is explained via quantized phonons (Bose particles) and Bose statistics, and lattice specific heat is introduced via determination of phonon density of state. Phonon scattering and electron scattering are explained. On this basis, explanation is then provided regarding the heat dependent nature of resistivity in metals, as well as of the Bloch-Gr#252neisen law at low temperature. Conductivity in semiconductors, especially scattering, is also explained.</p> <p>Superconductivity (3 classes)</p>					
Continue to 電気伝導(2)					

## 電気伝導(2)

With respect to superconductive phenomena, explanation is made, using the London equation, of the Meissner effect, etc. Overview explanation is made of the Ginzburg-Landau theory, and order parameters are introduced. The relationship between phase and vector potential, important for superconductivity, is explained, as well as the Josephson effect. Explained also is magnetic flux quantization within type II (high field) superconductors.

Feedback lesson (1 class)

Confirmation of learned content is made based on evaluations of short tests and the score on the final examination, etc.

### [Course requirements]

Those who would like to attend in this class are recommended to study electrodynamics, statistical physics, and introduction to the solid state devices in advance. The lecture is, however, given in Japanese.

### [Evaluation methods and policy]

Basically, an examination is imposed after the last class. A report may be imposed in case of necessity.

### [Textbooks]

C. Kittel 『Introduction to Solid State Physics 8th ed.』 ( Wiley ) ISBN:0471680575

### [References, etc.]

( Reference books )

Solid State Physics by Ashcroft and Mermin

### [Study outside of class (preparation and review)]

Preparing before classes and reviewing after classes are recommended.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG41 7R701 SB72				
<b>Course title (and course title in English)</b>	電子工学特別セミナー Advanced Seminar on Electronic Science and Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG41 7R823 PB72				
<b>Course title (and course title in English)</b>	研究インターンシップD ( 電子 ) Research Internship (D)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG41 7R825 SB72				
<b>Course title (and course title in English)</b>	電子工学特別演習1 Advanced Exercises on Electronic Science and Engineering I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG41 7R827 SB72				
<b>Course title (and course title in English)</b>	電子工学特別演習2 Advanced Exercises on Electronic Science and Engineering II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>		G-ENG15 5D043 SJ60   G-ENG14 7D043 SJ61   G-ENG13 8D043 SJ61 G-ENG17 8D043 SJ76			
<b>Course title (and course title in English)</b>	先端科学機器分析及び実習 Instrumental Analysis, Adv.I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOE KOUICHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.4,5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This postgraduate subject is aimed at students of the six chemistry majors offered by the Graduate School of Engineering. In this subject, lectures and practical training are provided in a relay format by the instructors in charge and TAs. The main purpose of this subject is to help students in postgraduate master's and doctoral programs acquire advanced scientific skills in instrumental analysis through lectures explaining principles of three advanced forms of instrumental analysis, and by offering practical training. In this subject, students take lectures on each instrument to acquire knowledge of analytic principles and methods. Following this, students receive basic and applied training for each instrument. In addition, students are asked to select two of three instruments, then take lectures on them before receiving practical training.					
<b>[Course objectives]</b>					
Through lectures and practical training, the subject ultimately aims to teach students about analysis methods involving the use of advanced scientific instruments, and to improve their analytical accuracy as a tool with which they can analyze new substances and scientific phenomena in individual research.					
<b>[Course schedule and contents]</b>					
Detailed discussion on advanced instrumental analysis (1 session) X-ray photoelectron spectroscopy, Auger electron spectroscopy, ion scattering spectroscopy, secondary ion mass spectrometry, and LEED are discussed.					
Detailed discussion on advanced instrumental analysis (1 session) The structure and usage method of the comprehensive surface analyzer (X-ray photoelectron spectrometer) are discussed.					
Detailed discussion on advanced instrumental analysis (1 session) How to use an X-ray powder diffractometer to conduct qualitative and quantitative analyses on solid powder is discussed.					
Detailed discussion on advanced instrumental analysis (1 session) The crystallite size-measuring method for metal oxide nanocrystals and the Rietveld refinement method for metal composite oxides are discussed.					
Detailed discussion on advanced instrumental analysis (1 session) The measurement principles of MALDI-TOF MS are discussed.					
Detailed discussion on advanced instrumental analysis (1 session)					
				Continue to 先端科学機器分析及び実習 (2)	

## 先端科学機器分析及び実習 (2)

Types of organic matrices and their scope of application, sampling methods, and methods of analyzing data are discussed.

Practical training involving the use of instruments [training for basic tasks] (2 sessions)

Students engage in practical training for tasks assigned by the instructor-in-charge.

Practical training involving the use of instruments [training for applied tasks] (2 sessions)

Students engage in practical training for tasks assigned by the instructor-in-charge.

### [Course requirements]

Students must have already taken “ Physical Chemistry, ” “ Organic Chemistry, ” “ Inorganic Chemistry, ” and “ Analytical Chemistry ” at the undergraduate level.

### [Evaluation methods and policy]

Students are evaluated based on reports and assignments given on practical training.

### [Textbooks]

Instructed during class

Distribute materials to be used based on the content of lectures

### [References, etc.]

( Reference books )

Others

### [Study outside of class (preparation and review)]

Contact us if necessary.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG13 8D046 SJ61   G-ENG17 8D046 SJ76   G-ENG15 5D046 SJ60 G-ENG14 7D046 SJ61			
<b>Course title (and course title in English)</b>	先端科学機器分析及び実習 Instrumental Analysis, Adv.II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOE KOUICHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.4,5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This postgraduate subject is aimed at students in the six chemistry majors offered by the Graduate School of Engineering. In this subject, lectures and practical training are provided in a relay fashion by the instructors-in-charge and TAs. The main purpose of each subject is to help students in graduate school master's and doctoral programs acquire advanced scientific instrumental analysis skills by understanding the principles of two types of advanced instrumental analysis and conducting practical training. Students will take lectures on each device to acquire knowledge of analysis principles and methods, and then carry out basic training and applied training for each device.					
<b>[Course objectives]</b>					
Through lectures and practical training, the subject ultimately aims to help students learn about analysis methods that involve the use of advanced scientific instruments, and to improve their analytical accuracy as a tool with which they can analyze new substances and scientific phenomena in their individual research.					
<b>[Course schedule and contents]</b>					
Advanced Instrumental Analysis (1 session) A review of HPLC-MASS, NMR, and STEM analysis.					
Advanced Instrumental Analysis (2 sessions) We will explain in detail the application of high performance liquid chromatography (HPLC) and mass spectrometry in the analysis of trace components in environmental samples and biological samples from this principle, as well as give a lecture on the high-sensitivity analysis method for tandem type equipment.					
Advanced Instrumental Analysis (2 sessions) Lectures will cover the measurement principle of NMR, the two-dimensional measurement method, and the data analysis method.					
Advanced Instrumental Analysis (2 sessions) Students will learn the principles, functions, features, and application examples of scanning transmission electron microscopes (STEMs), and attend lectures on high-resolution observation and element distribution analysis.					
Practical training using equipment [Basic task training] (2 sessions) Practicing tasks given by the instructor.					
Practical training involving the use of instruments [training for applied tasks] (2 sessions)					
----- Continue to 先端科学機器分析及び実習 (2)					

## 先端科学機器分析及び実習 (2)

Students engage in practical training for tasks assigned by the instructor-in-charge.

### [Course requirements]

Undergraduate level "Physical Chemistry," "Organic Chemistry," and "Analytical Chemistry" are required.

### [Evaluation methods and policy]

Evaluations of reports on practical exercise.

### [Textbooks]

Instructed during class

Distribute materials to be used based on the content of lectures.

### [References, etc.]

( Reference books )

Others

### [Study outside of class (preparation and review)]

Contact us if necessary.

### ( Other information (office hours, etc.) )

None

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG16 6D837 LJ61 G-ENG15 6D837 LJ61			
<b>Course title (and course title in English)</b>	Supramolecular Chemistry Supramolecular Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, Juha Lintuluoto Graduate School of Engineering Senior Lecturer, LANDENBERGER, Kira Beth	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>This course is open to all master and doctoral engineering students. The aim is to enhance students' knowledge of non-covalent molecular interactions found in both synthetic and natural chemical compounds and materials. Additionally, students learn how to choose methods to study and observe non-covalent molecular interactions, and how to measure and evaluate them quantitatively. Throughout the course feedback will be given by instructors. The course will also improve students to gain confidence in studying English of supramolecular topics. The course contents are suitable for a wide variety of chemistry students.</p>					
<b>[Course objectives]</b>					
<p>Understanding the nature and types of supramolecular interactions, and applying them into various chemical, biological and other materials applications.</p>					
<b>[Course schedule and contents]</b>					
<p>1. Course Introduction &amp; Interactions and methods in Supramolecular Chemistry: Non covalent interactions (H-bonding, pi-pi; lone-pairs and metals, ionic), spectrometric methods (NMR, UV-vis, Fluorescence, CD, Mass) Oct. 4</p> <p>2. Binding Constants, Cooperativity, Complementarity, Preorganization Equilibrium systems, enthalpy and entropy upon binding, quantitative analysis Oct.11</p> <p>3. Cation Binding with Current Examples Cation binding, binding into anionic host molecules and neutral host molecules Oct.18</p> <p>4. Anion Binding with Current Examples Anion binding, binding into cationic host molecules, and neutral host molecules Oct. 25</p> <p>5. Neutral molecule binding and Self-Assembly with Current Examples Neutral molecule binding into neutral or charged host molecules, self-binding molecules Nov.1</p> <p>6. Supramolecular Devices, Sensors and Catalysis with Current Examples Electron transfer, energy transfer, information transfer in supramolecules Nov. 8</p> <p>7. Crystal Engineering I: Crystal engineering, crystal classes, crystal nucleation and growth, commonly found intermolecular interactions Nov. 15</p>					
<p style="text-align: right;">----- Continue to Supramolecular Chemistry (2)</p>					

## Supramolecular Chemistry (2)

8. Crystal Engineering II: Polymorphism, hydrates and solvates, cocrystals, crystal structure prediction Nov. 29

9. Network Solids: Zeolites, intercalates, coordination polymers (e.g. MOFs) Dec.6

10. Solid State Inclusion Compounds I: Clathrates (structures and applications), podands, cyclophanes, etc. Dec. 13

11. Solid State Inclusion Compounds II: Cucurbiturils, cyclodextrins, cryptophands, etc. Dec. 20

12. Microcalorimetry Isothermal titration calorimetry to analyze binding thermodynamics of biomolecules. Differential scanning calorimetry to analyze folding thermodynamics of proteins. Nov.16\* Lecturer Prof. Oda, Kyoto Prefectural University Dec. 28

13. Supramolecular Liquid Crystals: Nature and structure of liquid crystals, applications and design, polymeric liquid crystals Jan. 10

14. Supramolecular Polymers, Gels and Fibers: Supramolecular polymer structure and design, properties, kinetics and reaction mechanics of supramolecular polymers, applications Jan.17

### [Course requirements]

Active engagement in lectures, which provide basis for the reports required in this course. Each student is required to submit 4 chosen reports on any given topics during the course. However, 2 reports each should be submitted for the given topics on lectures 1-6 and 8-14, excluding lecture 12.

If you have any concerns or questions regarding the course, please do not hesitate to contact (075)- 383-7065 or landenberger.kirabeth.2x@kyoto-u.ac.jp or (075)-383-2876 or lintuluoto.juhamikael.7u@kyoto-u.ac.jp .

### [Evaluation methods and policy]

Evaluation: 20% participation (engaging the classes and activity), 80% reports.

\*More than 3 unexcused absence can result in course failure.

### [Textbooks]

Not fixed

### [References, etc.]

( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Students should fulfill the report tasks out of class time (home work).

Continue to Supramolecular Chemistry (3)

## Supramolecular Chemistry (3)

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG15 6H041 LJ60 G-ENG13 6H041 LJ60			
<b>Course title (and course title in English)</b>	有機金属化学 1 Organotransition Metal Chemistry 1		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Chemical Research Professor, NAKAMURA MASAHARU Graduate School of Engineering Professor, MATSUBARA SEIJIROU Graduate School of Engineering Associate Professor, KURAHASHI TAKUYA Graduate School of Engineering Professor, SUGINOME MICHINORI Graduate School of Engineering Professor, OHKI YASUHIRO Graduate School of Engineering Associate Professor, ISHIDA NAOKI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Organomagnesium compounds, 1time, Synthesis, structure, and reaction of organomagnesium compounds Organolithium compounds, 1time, Synthesis, structure, and reaction of organolithium compounds Organozinc compounds, 1time, Synthesis, structure, and reaction of organozinc compounds Organoboron compounds, 1time, Synthesis, structure, and reaction of organoboron compounds Organosilicon compounds, 1time, Synthesis, structure, and reaction of organosilicon compounds Organocopper compounds, 1time, Synthesis, structure, and reaction of organocopper compounds Rare earth metals, 1time, Synthesis, structure, and reaction of rare earth metals Other transition-metal compounds, 1time, Synthesis, structure, and reaction of other transition-metal compounds such as Ti, Zr, Cr, and Fe Basic reaction of organotransition-metal compounds, 1time, Ligand substitution reaction, oxidative addition, oxidative cyclization, reductive elimination, transmetallation, carbonyl insertion Catalytic enantioselective reaction, 1time, Enantioselective hydrogenation, enantioselective oxidation (Sharpless reactions), enantioselective C-C bond formation Coupling reaction, 1time, C-C Bond forming reactions (cross coupling reactions)					
<b>[Course requirements]</b>					
None					
-----					
Continue to 有機金属化学 1 (2)					



## 有機金属化学 1 (2)

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### [Evaluation methods and policy]

### [Textbooks]

none

### [References, etc.]

#### ( Reference books )

J. F. Hartwig, Organotransition metal chemistry. From bonding to catalysis., University Science Books, Mill Valley, CA, 2010.

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H818 LJ60   G-ENG16 5H818 LJ60   G-ENG13 6H818 LJ60				
<b>Course title (and course title in English)</b>	先端有機化学 Advanced Organic Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOE KOUICHI Institute for Chemical Research Associate Professor, HIROSE TAKASHI Graduate School of Engineering Associate Professor, NAGAKI AIICHIROU Graduate School of Engineering Associate Professor, KIMURA YUU	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
To acquire basic concepts and principles of organic chemistry; to understand different reactions, from basic to cutting-edge, and the syntheses based on them; to propose synthetic routes for given target organic compounds; and to make related presentations. Develop the ability of total organic synthesis through discussions.					
<b>[Course objectives]</b>					
Understand basic concepts and principles of organic chemistry and acquire the ability to think of synthetic routes for relatively complex organic compounds based on them.					
<b>[Course schedule and contents]</b>					
Chemoselectivity (2 sessions) Introduction and chemoselectivity  Regioselectivity (2 sessions) Controlled Aldol Reactions  Stereoselectivity (2 sessions) Stereoselective Aldol Reactions  Strategies (2 sessions) Alternative Strategies for Enone Synthesis  Choosing a Strategy (2 sessions) The Synthesis of Cyclopentenones  Summary (2 sessions) Proposal and Presentation regarding Total Synthesis of Target Molecules					
<b>[Course requirements]</b>					
Students should have a good understanding of undergraduate organic chemistry.					
<b>[Evaluation methods and policy]</b>					
Comprehensive evaluation by quizzes of each unit and investigation / presentation of the total synthetic route of target compound.					
----- Continue to 先端有機化学(2) -----					

## 先端有機化学(2)

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Grades are evaluated based on raw scores of the overall evaluation

### [Textbooks]

Paul Wyatt, Stuart Warren "Organic Synthesis. Strategy and Control" (Wiley) ISBN: 978-0-471-92963-5

### [References, etc.]

( Reference books )

Others

### [Study outside of class (preparation and review)]

Students should briefly glance over the handouts and textbook, and prepare for the contents of each unit before attending any lecture. In addition, students will deepen their understanding of the contents of each unit based on quiz tasks assigned in each lecture and their reviews. It is advisable for students to devote twice the time spent in teaching sessions to prepare for and review these sessions. In addition, students must devote sufficient time to investigation of the total synthetic route of the target compound given as a task, preparation of its proposal, and preparation for an oral presentation.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG12 6D037 EJ61				
<b>Course title (and course title in English)</b>	材料化学特別実験及演習 Laboratory and Exercise in Material Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NUMATA KEIJI	
<b>Target year</b>		<b>Number of credits</b>	8	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,60times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG12 5H001 LJ62				
<b>Course title (and course title in English)</b>	無機材料化学 Chemistry of Inorganic Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TANAKA KATSUHISA Graduate School of Engineering Professor,MIURA KIYOTAKA Graduate School of Engineering Professor,FUJITA KOJI Graduate School of Engineering Associate Professor,SHIMOTSUMA YASUHIKO		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Structure, characterization, synthesis, and properties of inorganic materials are described on the basis of solid-state chemistry of inorganic matters.						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,4times, ,4times, ,1time, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG12 5H004 LJ60					
<b>Course title (and course title in English)</b>	有機材料化学 Chemistry of Organic Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIAKI Graduate School of Engineering Professor, MATSUBARA SEIJIROU		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,1time, ,1time, ,3times, ,1time, ,1time, ,3times, ,2times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG12 5H007 LJ62					
<b>Course title (and course title in English)</b>	高分子材料化学 Chemistry of Polymer Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NUMATA KEIJI Graduate School of Engineering Associate Professor, HORINAKA JIYUNICHI Graduate School of Engineering Senior Lecturer, OOMAE MASASHI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
physical properties of polymers, 3 times, physical properties of polymers structure and physics of high-performance polymers, 3 times, structure and physics of high-performance polymers molecular design and function of functional polymers, 6 times, molecular design and function of functional polymers ”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG12 6H010 LJ61				
<b>Course title (and course title in English)</b>	機能材料化学 Chemistry of Functional Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, FUJITA KOJI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In this course, we introduce some examples of the research on various functional materials, which have been studied in the laboratories of the Department of Material Chemistry.					
<b>[Course objectives]</b>					
To gain basic knowledge on the current and future prospects of functional materials, focusing on methodologies/techniques for enhancing the functionality of various materials or adding new functions.					
<b>[Course schedule and contents]</b>					
Week 1-2 High-pressure synthesis of inorganic materials Week 3-4 Development of functional materials using laser material processing Week 5 Magneto-optical materials Week 6 Synthetic organic chemistry driven by artificial intelligence (AI) Week 7 Catalytic reactions in organic chemistry Week 8 High-performance separation analysis using specific interactions Week 9 Biomaterial design for disease treatment Week10 Mechanical properties of polymers Week11 Development of novel functional electrodes for electroanalysis					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Grading will be based on active participation and assignments. Assignments will be assessed on the basis of achievement level for course goals.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
Students are requested to review the lectures					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG12 6H015 LJ62				
<b>Course title (and course title in English)</b>	応用固体化学 Industrial Solid-State Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TANAKA KATSUHISA	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>応用科学としての材料化学を理解する上で不可欠な基礎科学としての固体化学について,特に固体の物性に重点を置いて講述する。結晶中の原子の動力学と格子振動,準粒子としてのフォノンの概念,格子振動に基づく結晶の熱的性質,金属結晶の自由電子フェルミ気体モデルと電気伝導ならびに熱伝導,周期的ポテンシャル場での電子の挙動とバンド構造,誘電体の基礎と強誘電体の相転に関するランダウ理論などについて説明する。</p>					
<b>[Course objectives]</b>					
<p>結晶の格子振動と熱的性質,金属結晶における自由電子の挙動と電気伝導ならびに熱伝導,バンド構造,強誘電体の相転移を定量的に理解する。</p>					
<b>[Course schedule and contents]</b>					
<p>・結晶の中の原子の動力学(3):調和振動子近似による格子振動の定式化,音響モードと光学モードの概念,フォノンの状態密度とデバイモデルによる格子比熱の表現,非調和振動と熱膨張,フォノン気体と熱伝導について説明する。</p> <p>・結晶の中の電子(5):自由電子フェルミ気体の概念,フェルミ-ディラック分布とそれから導かれる電子比熱,ドルーデの理論と金属の電気伝導ならびに熱伝導について説明する。また,磁場中の自由電子の挙動に関連して,ランダウ準位,サイクロトロン共鳴,ホール効果について述べる。さらに,周期的ポテンシャル場で運動する電子の挙動の解析により導かれるバンド構造の考え方を説明する。</p> <p>・強誘電体と構造相転移(3):誘電分極など誘電体の基礎的事項について述べたあと,強誘電体結晶の具体例を挙げ,強誘電体の相転移に関する熱力学的現象論であるランダウ理論について説明する。</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
レポートによる。					
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Continue to 応用固体化学(2)					

## 応用固体化学(2)

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### [Textbooks]

講義中に資料を配布する .

### [References, etc.]

( Reference books )

永田一清 『物性物理学』 ( 裳華房 )

### [Study outside of class (preparation and review)]

教科書の予習・復習を充分行うこと .

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG12 6H019 LJ60					
<b>Course title (and course title in English)</b>	有機材料合成化学 Synthesis of Organic Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA SEIJIROU Graduate School of Engineering Professor,NAKAO YOSHIAKI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,3times, ,3times, ,3times, ,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG12 5H025 LJ61			
<b>Course title (and course title in English)</b>	材料解析化学 Analysis and Characterization of Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OTSUKA KOJI Graduate School of Engineering Associate Professor, OYAMA MUNETAKA Graduate School of Engineering Associate Professor, KUBO TAKUYA	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The principles, equipment, measurement methods, applications, etc. of recent advances in instrumental analytical chemistry will be introduced. The method for structure and reaction analysis of organic and inorganic materials will also be discussed.					
<b>[Course objectives]</b>					
Understand the principles, outlines, and applications of recent instrumental analysis methods in material analysis.					
<b>[Course schedule and contents]</b>					
<p>Chromatography and electrophoresis (4): Regarding chromatography, which is widely used as a separation analysis method, basic theory, and applications, focusing on high performance liquid chromatography (HPLC), will be discussed. In addition, the basics and applied theory of capillary electrophoresis (CE), which is used as a high-performance microseparation analysis method, are also be introduced.</p> <p>Electrochemical analysis and material analysis (3): Electroanalytical chemical measurement methods, which are important as analysis methods for material formation processes, will be explained focusing on cyclic voltammetry in organic solvents. In addition, from the standpoint of measurement and analysis methods, determination of redox potentials of organic compounds and metal complexes and reaction analysis methods of electrolytically active species will be discussed.</p> <p>Separation agent design basics and resolution evaluation (3): Regarding silica-based and polymer-based separation media that are widely used in liquid phase separation, the basic synthesis method and the performance evaluation method of the obtained separation media will be discussed.</p> <p>Recent Technology Trends (Topics) (1): The latest technology trends in chemical technology will be introduced in terms of topics, as well as checking the learning achievement level.</p> <p>Feedback on evaluations (1)</p>					
<b>[Course requirements]</b>					
It is recommended that students have learned analytical chemistry and instrumental analysis at the Department of Industrial Chemistry, Faculty of Engineering, Kyoto University, such as "Analytical					
Continue to 材料解析化学(2)					

## 材料解析化学(2)

Chemistry (Frontier Chemistry)", "Instrumental Analysis (Frontier Chemistry)", and "Advanced Instrumental Analysis (Frontier Chemistry)".

### [Evaluation methods and policy]

Comprehensive evaluation of regular test results and reports / quizzes.

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

It is recommended to scrutinize and review the content after each class.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG12 6H029 LJ61					
<b>Course title (and course title in English)</b>	高分子機能物性 Polymer Physics and Function		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, HORINAKA JIYUNICHI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,3times, ,2times, ,1time, ,2times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG12 6P055 LB61					
<b>Course title (and course title in English)</b>	材料化学特論第一 Material Chemistry Adv. I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NUMATA KEIJI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times, ,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG12 6P056 LB61					
<b>Course title (and course title in English)</b>	材料化学特論第二 Material Chemistry Adv. II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NUMATA KEIJI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG12 7P110 LB61					
<b>Course title (and course title in English)</b>	材料化学総論 General Material Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NUMATA KEIJI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG12 7P111 LJ61					
<b>Course title (and course title in English)</b>	化学産業特論 Chemical Industry, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NUMATA KEIJI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG42 7S001 LJ61				
<b>Course title (and course title in English)</b>	機能材料設計学 Design of Functional Materials		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, FUJITA KOJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In this course, we introduce some examples of the research on various functional materials, which have been studied in the laboratories of the Department of Material Chemistry.					
<b>[Course objectives]</b>					
To gain basic knowledge on the current and future prospects of functional materials, focusing on methodologies/techniques for enhancing the functionality of various materials or adding new functions.					
<b>[Course schedule and contents]</b>					
Week 1-2 High-pressure synthesis of inorganic materials Week 3-4 Development of functional materials using laser material processing Week 5 Magneto-optical materials Week 6 Synthetic organic chemistry driven by artificial intelligence (AI) Week 7 Catalytic reactions in organic chemistry Week 8 High-performance separation analysis using specific interactions Week 9 Biomaterial design for disease treatment Week10 Mechanical properties of polymers Week11 Development of novel functional electrodes for electroanalysis					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Grading will be based on active participation and assignments. Assignments will be assessed on the basis of achievement level for course goals.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
Students are requested to review the lectures					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG42 7S002 SJ61				
<b>Course title (and course title in English)</b>	機能材料設計学特論 Design of Functional Materials, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, FUJITA KOJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In this course, we will offer lectures about recent progress and future prospects for the development of functional materials in a seminar format.					
<b>[Course objectives]</b>					
To promote problem-solving abilities by understanding comprehensively the research results and latest trends in the development of functional materials.					
<b>[Course schedule and contents]</b>					
Week 1-6 Explain and discuss basic research leading to the addition of functionality to various materials					
Week 7-11 Discuss recent research trends and topics on functional materials and devices					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Grading will be based on active participation and assignments. Assignments will be assessed on the basis of achievement level for course goals.					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
Students are requested to review the lectures.					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG42 7S003 SJ62					
<b>Course title (and course title in English)</b>	無機構造化学特論 Inorganic Structural Chemistry, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MIURA KIYOTAKA Graduate School of Engineering Associate Professor, SHIMOTSUMA YASUHIKO Graduate School of Engineering Assistant Professor, shimizu masahiro		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,8times, ,7times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG42 7S006 SJ62					
<b>Course title (and course title in English)</b>	応用固体化学特論 Industrial Solid-State Chemistry, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TANAKA KATSUHISA		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Mon.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Students will learn recent topics and future prospects in the fields of solid-state chemistry and its applications by attending a seminar.						
<b>[Course objectives]</b>						
To be able to grab the trends of research in the fields of solid-state chemistry and its applications.						
<b>[Course schedule and contents]</b>						
Magnetic materials (8) Students will discuss recent research activities and future prospects about magnetic materials.						
Optical materials (7) Students will discuss recent research activities and future prospects about optical materials.						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Evaluation will be based on class performance.						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
Students should prepare for the class by referring to textbooks of solid-state chemistry and related fields and also review what they would learn based on materials handed out in the seminar.						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG42 7S010 SJ59				
<b>Course title (and course title in English)</b>	有機反応化学特論 Organic Reaction Chemistry, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUBARA SEIJIROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
, 1 5 times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG42 7S013 SJ60				
<b>Course title (and course title in English)</b>	天然物有機化学特論 Organic Chemistry of Natural Products, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG42 7S016 SJ61				
<b>Course title (and course title in English)</b>	材料解析化学特論 Analytical Chemistry of Materials, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OTSUKA KOJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Study the recent progress and future prospects of analytical chemistry of materials in a seminar format.					
<b>[Course objectives]</b>					
Understanding recent progress, current status and future prospects of material analysis chemistry.					
<b>[Course schedule and contents]</b>					
Seminar / Intensive lecture (15): Lecture on the latest topics in analytical chemistry of materials.					
<b>[Course requirements]</b>					
It is desirable that students have taken or have equivalent knowledge in the Master's Program in Material Chemistry, Graduate School of Engineering, Kyoto University, "Analytical Chemistry of Materials" and "Analytical Chemistry of Materials II".					
<b>[Evaluation methods and policy]</b>					
Comprehensively evaluate the content of presentations and discussions at seminars.					
<b>[Textbooks]</b>					
Instructed during class					
<b>[References, etc.]</b>					
( <b>Reference books</b> )					
Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
It is recommended to scrutinize and review the content after each class.					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG42 7S019 SJ61				
<b>Course title (and course title in English)</b>	高分子材料物性特論 Physical Properties of Polymer Materials, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, HORINAKA JIYUNICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG42 7S022 SJ62				
<b>Course title (and course title in English)</b>	高分子材料合成特論 Synthesis of Polymer Materials, Advanced		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NUMATA KEIJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG13 7D230 LJ60				
<b>Course title (and course title in English)</b>	物質エネルギー化学特論第三 Energy and Hydrocarbon Chemistry, Adv. III		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KIMURA YUU Institute for Chemical Research Assistant Professor, ISOZAKI KATSUHIRO Graduate School of Engineering Assistant Professor, YOKOYAMA YUKO	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Basic knowledge on the electronic states of organic molecules and on the nature of light-materials interactions is essential to understand the characteristics of organic molecules from a panoramic view. In this course, we offer the lecture regarding the basic knowledge of optical properties and supramolecular functions of organic molecules, especially from the viewpoint of structural organic chemistry and photochemistry.</p>					
<b>[Course objectives]</b>					
<ul style="list-style-type: none"> <li>• Nurture the ability to understand the relationship between molecular structures and their properties from the view point of quantum chemistry and physical chemistry.</li> <li>• To understand the latest trend of molecular functions based on the interaction between light and materials.</li> </ul>					
<b>[Course schedule and contents]</b>					
<p>[Topic] Physical Organic Chemistry; Photochemistry; Supramolecular Chemistry; Photoexcited States; Emission Properties</p> <ol style="list-style-type: none"> <li>1. Introduction on genetics and course guidance</li> <li>2. Lecture on Physical Organic Chemistry (1): Molecular Structures and Aromaticity</li> <li>3. Lecture on Physical Organic Chemistry (2): Supramolecular Assemblies and Functions</li> <li>4. Lecture on Physical Organic Chemistry (3): Single-Molecule Measurements and Single Molecular Properties</li> <li>5. Lecture on Photochemistry (1): Photoexcited States of Organic Compounds</li> <li>6. Lecture on Photochemistry (2): Chromic Behaviors upon External Stimuli</li> <li>7. Lecture on Photochemistry (3): Intermolecular Interactions and Aggregate-Induced Emission (AIE)</li> <li>8. Lecture on Photochemistry (4): Properties Related to Circular Polarized Lights (CD, Circular Dichroism; CPL, Circularly Polarized Luminescence)</li> </ol>					
<p style="text-align: right;">Continue to 物質エネルギー化学特論第三(2)</p>					

物質エネルギー化学特論第三(2)

**[Course requirements]**

None

**[Evaluation methods and policy]**

Evaluation will be based on reports (e.g., outline and significance of own researches, comments on the lectures, etc.)

**[Textbooks]**

No textbook specified.

**[References, etc.]**

**( Reference books )**

Several related reference books will be introduced during lecture.

**[Study outside of class (preparation and review)]**

Be similar to general lectures.

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG13 7D231 LJ60			
<b>Course title (and course title in English)</b>	物質エネルギー化学特論第四 Energy and Hydrocarbon Chemistry, Adv. IV		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, KIMURA YUU Institute for Chemical Research Assistant Professor, ISOZAKI KATSUHIRO Graduate School of Engineering Assistant Professor, YOKOYAMA YUKO	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Equivalent to Energy and Hydrocarbon Chemistry, Adv. III					
<b>[Course objectives]</b>					
Equivalent to Energy and Hydrocarbon Chemistry, Adv. III					
<b>[Course schedule and contents]</b>					
Guidance, 1time, Overview of this course. Lecture (1), 1time, Frontier orbit theory and Diels-Alder reaction (Fujihara) Lecture (2), 1time, Olefin metathesis (Fujihara) Lecture (3), 1time, Cross coupling reactions (Fujihara) Lecture (4), 1time, Catalytic Asymmetric reactions (Fujihara) Lecture (5), 1time, Structures of proteins: X-ray analysis and Mass spectroscopy (Fujihara) Lecture (6), 1time, Semiconductors (Tomita) Lecture (7), 1time, Scanning electron microscope (Tomita) Lecture (8), 1time, Fullerenes (Hashikawa) Lecture (9), 1time, Nuclear magnetic resonances (Hashikawa) Exercise, 4times, Group Works (Fujihara, Tomita, Hashikawa) Feedback, 1time, Feedback of this course (Fujihara)					
<b>[Course requirements]</b>					
Equivalent to Energy and Hydrocarbon Chemistry, Adv. III					
<b>[Evaluation methods and policy]</b>					
Equivalent to Energy and Hydrocarbon Chemistry, Adv. III					
<b>[Textbooks]</b>					
Equivalent to Energy and Hydrocarbon Chemistry, Adv. III					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Equivalent to Energy and Hydrocarbon Chemistry, Adv. III					
<b>[Study outside of class (preparation and review)]</b>					
( <b>Other information (office hours, etc.)</b> )					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG13 6D234 EJ60				
<b>Course title (and course title in English)</b>	物質エネルギー化学特別実験及演習 Experiments & Exercises in Energy and Hydrocarbon Chemistry, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAGEYAMA HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	8	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times, ,10times, ,10times, ,10times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG13 7D235 LJ60					
<b>Course title (and course title in English)</b>	物質エネルギー化学特論第七 Energy and Hydrocarbon Chemistry, Adv.VII		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KAGEYAMA HIROSHI Graduate School of Engineering Associate Professor,MIKI KOUJI		
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,1time, ,, ,, ,, ,,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG13 7D236 LJ60					
<b>Course title (and course title in English)</b>	物質エネルギー化学特論第八 Energy and Hydrocarbon Chemistry, Adv.VIII		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KAGEYAMA HIROSHI Graduate School of Engineering Senior Lecturer,NAKADA AKINOBU		
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG13 7H201 LJ60 G-ENG13 7H201 LJ61			
<b>Course title (and course title in English)</b>	エネルギー変換反応論 Energy Conversion Reactions		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KAGEYAMA HIROSHI Graduate School of Engineering Professor,ABE TAKESHI Graduate School of Engineering Professor,ABE RYUU Graduate School of Engineering Program-Specific Professor,INUI NAOKI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
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Continue to エネルギー変換反応論(2)					

## エネルギー変換反応論(2)

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### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG13 6H208 LB60					
<b>Course title (and course title in English)</b>	物質エネルギー化学特別セミナーA Seminar on Energy & Hydrocarbon Chemistry (A)			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAGEYAMA HIROSHI Graduate School of Engineering Associate Professor, MIKI KOUJI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,6times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG13 7h209 LJ25 G-ENG13 7H209 LJ25					
<b>Course title (and course title in English)</b>	先端医工学 Advanced Biomedical Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KONDOU TERUYUKI Graduate School of Engineering Associate Professor,KIMURA YUU		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,3times, ,2times, ,2times, ,1time, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG13 5H210 LJ60				
<b>Course title (and course title in English)</b>	有機錯体化学 Chemistry of Organometallic Complexes		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, FUJIHARA TETSUAKI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Basic organometallic chemistry including history, structure, bonding, reactions, and survey of various metal complexes is lectured. Several typical catalytic reactions are explicated on the basis of elementary steps in organometallic chemistry such as ligand substitution, oxidative addition, reductive elimination, and insertion reactions.					
<b>[Course objectives]</b>					
Acquirement of basic idea of: 1. General properties of transition metal organometallic complexes 2. Reactivity of transition metal organometallic compounds 3. Homogeneous catalysis of practical importance 4. Recent research trends in homogeneous catalysis					
<b>[Course schedule and contents]</b>					
Introduction, 1time, History Application Research trends Zaise salt Grignard reagent Alkyl lithium Ferrocene General properties of organometallic complexes, 1time, Bonding Structure in general Coordination number eta-Structure mu-Structure Organometallic seminar (1), 1time, Number of d- and s-electrons Classification and the nature of ligands Effect of complexation Formal charge Electron counting 18-electron rule Oxidation state General properties and reactivities of transition metal organometallic complexes, 3times, Several important steps in transition-metal complex catalyzed reactions are discussed, including coordination, oxidative addition, insertion, reductive elimination. Recent research trends in homogeneous catalysis (1), 1time, Wacker process Various cross-coupling reaction Mizoroki-Heck reaction Recent research trends in homogeneous catalysis (2), 1time, C-H and C-C bond activation Organometallics in materials science (1), 2times, Asymmetric catalysis Organometallics in materials science (2), 1time, Structural materials Organometallic seminar (2), 1time, Electronic and optoelectronic applications					
<b>[Course requirements]</b>					
Basic knowledge in organic chemistry, physical chemistry, and inorganic chemistry is requisite.					
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Continue to 有機錯体化学(2)					

## 有機錯体化学(2)

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### [Evaluation methods and policy]

Graded by written examination

### [Textbooks]

No textbooks are used.

### [References, etc.]

#### ( Reference books )

R.H.Crabtree, The Organometallic Chemistry of the Transition Metals Fourth Edition; Wiley-Interscience: Hoboken, 2005.

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG13 7H217 LJ61					
<b>Course title (and course title in English)</b>	資源変換化学 Chemical Conversion of Carbon Resources		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, ABE RYUU Graduate School of Engineering Associate Professor, FUJIHARA TETSUAKI Graduate School of Engineering Senior Lecturer, NAKADA AKINOBU		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
(1) Introduction of chemical conversion of resources, 1time, (2) Chemical conversion using semiconductor photocatalysts, 1time, (3) Hydrogen production from water using photocatalysts (1), 1time, (4) Hydrogen production from water using photocatalysts (2), 1time, (5) Reduction of CO <sub>2</sub> using photocatalysts, 1time, (6) Fine chemical synthesis using photocatalysts, 1time, (7) Basic science of catalysis, 1time, (8) Hydrogen production from fossil resources, 1time, (9) Petroleum refinery process (1), 1time, (10) Petroleum refinery process (2), 1time, (11) Biomass technology and future energy carriers, 1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<div style="text-align: right;">Continue to 資源変換化学(2)</div>						



資源变换化学(2)

[Study outside of class (preparation and review)]

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG13 6H219 LJ60				
<b>Course title (and course title in English)</b>	構造有機化学 Structural Organic Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Chemical Research Professor,MURATA YASUJIROU Institute for Chemical Research Associate Professor,HIROSE TAKASHI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,2times, ,1time, ,1time, ,1time, ,1time, ,4times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG13 5H222 LJ60					
<b>Course title (and course title in English)</b>	物質変換化学 Chemical Transformations		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Chemical Research Professor, NAKAMURA MASA HARU		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
This course explains the basic chemistry of functional organometallics, aiming to help students understand the syntheses/structures/reactivities/functions of these compounds with a focus on applications in molecular transformation and organic synthesis.						
<b>[Course objectives]</b>						
To gain molecular-level insight into the reactivity and photo- and electro-functions of organometallic compounds based on elements science and to be able to apply it to the students; daily research, hopefully.						
<b>[Course schedule and contents]</b>						
course guidance and introduction, 1 time, 4/9 course guidance/introduction/assessment test syntheses, properties, and applications of functional metal nano particles, 6 times, 4/16-5/28 main group organometallics in molecular transformations syntheses, properties, and applications of organo main group metal compounds, 4 times, 6/4-7/2 transition metal organometallic in photo- and electro-functional materials						
<b>[Course requirements]</b>						
knowledge of undergraduate organic chemistry						
<b>[Evaluation methods and policy]</b>						
examinations (quizzes in classes and final achievement test)						
<b>[Textbooks]</b>						
Not fixed						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
This course is provided at Uji campus in the odd-number academic years and at Katsura campus in the even-number academic years.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG13 6H226 LJ60				
<b>Course title (and course title in English)</b>	錯体触媒設計学 Chemistry of Well-Defined Catalysts		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OHKI YASUHIRO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>This course aims to understand the properties, reactions, photo functions, and natural activities of transition metal complexes at the atomic and molecular levels. In particular, the theme of the lectures will be to "solve the mysteries" that approach the relationship between metals and their functions. We will explore the details that cannot be addressed in Inorganic Chemistry 2 (Undergraduate Lecture) of the Advanced Chemistry Course of the Department of Industrial Chemistry and the Organometallic Chemistry 2 (Graduate lecture, Alternate years, First semester Fri. 1) of the Advanced Chemical Studies Group. In the first few lectures, we will cover the basic concepts necessary for understanding the whole course and review some of the areas that overlap with undergraduate lectures.</p> <p>This course is primarily targeted at master's course students.</p>					
<b>[Course objectives]</b>					
<p>In this course, students will systematically study</p> <ul style="list-style-type: none"> <li>• The structure and bonding of transition metal complexes while reviewing some elements.</li> <li>• Elementary reactions and their mechanisms forming the basis of homogenous catalytic reactions while reviewing some of the elements.</li> <li>• Typical homogeneous catalytic reactions and their applications to organic synthesis and polymer synthesis.</li> <li>• Why transition metals are necessary for homogeneous catalytic reactions and how they function at the atomic and molecular levels.</li> <li>• Why transition metals, which only exist in trace amounts, are necessary for natural reactions and functions.</li> <li>• Biological reactions and functions involving transition metals based on complex chemistry.</li> </ul>					
<b>[Course schedule and contents]</b>					
<p>Structure of transition metal complexes</p> <ul style="list-style-type: none"> <li>• Formal oxidation numbers, valence electron numbers, complex structure and crystal field theory, type and properties of ligands</li> <li>• Ligand field theory, the <math>\pi</math>-type interaction between d orbitals and ligands, 18-electron rule</li> </ul> <p>Basic reactions of transition metal complexes</p> <ul style="list-style-type: none"> <li>• Ligand substitute reactions (types and mechanisms of reactions, trans influence and trans effects), etc.</li> </ul> <p>Basic reactions of organometallic complexes</p> <ul style="list-style-type: none"> <li>• Oxidative addition reaction, reductive elimination reaction, insertion reaction, etc.</li> </ul> <p>Details of typical homogenous catalytic reactions</p> <ul style="list-style-type: none"> <li>• Hydrogenation; Cross-coupling; Olefin metathesis, etc.</li> <li>• Polymerization reactions such as coordination polymerization, chemical industry reactions to synthesize aldehydes and acetic acids, etc.</li> </ul> <p>Photofunctional and Pharmaceutical Activities of Transition Metal Complexes</p> <ul style="list-style-type: none"> <li>• Dye-sensitized solar cells, organic EL, cisplatin, etc.</li> </ul>					
Continue to 錯体触媒設計学(2)					

## 錯体触媒設計学(2)

### Chemistry of Transition Metal Complexes in Nature

- Metals and ligands used in biological activities: trace elements, function and coordination modes of amino acid residues (side chains)
- Electron transfer, respiration and oxygen transport: ferredoxin, type I copper protein, hemoglobin, etc.
- Oxidation reactions: Cytochrome oxidase, methane monooxygenase, dioxygenase, etc.
- Reduction reactions: Hydrogenase, hydrogenase with CO, Nitrogenase, etc.

### [Course requirements]

Students are expected to have undergraduate-level knowledge of the fundamentals of complex chemistry.

### [Evaluation methods and policy]

Evaluation is based on the report assignment per class. The main objective of the report assignments is to improve creative thinking ability, which is important for active participation in society. Attendance requirements will be taken into account to attain balance with research activities.

### [Textbooks]

In addition, lecture materials will be provided/distributed separately.

### [References, etc.]

#### ( Reference books )

Tomoaki Tanase et al. "錯体化学「有機・無機複合体の分子科学」" (Sankyo Shuppan, 2021) Book purchase is not a course requirement, Fumiyuki Ozawa and Hisao Nishiyama "朝倉化学体系16「有機遷移金属化学」" (Asakura Shoten, 2016) Book purchase is not a course requirement, Shinobu Itoh, Shigetoshi Aono, and Takashi Hayashi "フロンティア生物無機化学" (Sankyo Shuppan, 2016) Book purchase is not a course requirement.

### [Study outside of class (preparation and review)]

N/a

### ( Other information (office hours, etc.) )

Classes will be held at the Uji Campus during odd-numbered years and Katsura Campus during even-numbered years.

Scheduled as hybrid (face-to-face-oriented) lectures.

Students from other campuses (or those of the same campus with special needs) will be allowed to participate online. However, face-to-face lectures will be prioritized, so please be aware that online participants may face some inconvenience. If the number of people wishing to attend face-to-face lectures is small, we will switch to online lectures.

The lectures will be conducted in Japanese, but we may switch to English with the consent of the students, if necessary, to accommodate international students. Materials are prepared in Japanese.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG13 5H232 LJ60					
<b>Course title (and course title in English)</b>	物質エネルギー化学特論第五 Energy and Hydrocarbon Chemistry, Adv.V		<b>Instructor's name, job title, and department of affiliation</b>	Part-time Lecturer,SASAMORI TAKAHIRO Graduate School of Engineering Professor,KAGEYAMA HIROSHI		
<b>Target year</b>	1st year students or above	<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
有機化学・無機化学研究において、単結晶X線結晶構造解析の果たしている役割について紹介する。測定原理、測定の流れ、などの紹介とともに、有機化学・無機化学研究の特に合成に携わる研究者が単結晶X線結晶構造解析を行う際の手順と注意事項について解説する。合成化学研究における単結晶X線結晶構造解析の意味を理解し、その結果について考察ができる基礎知識を習得する。						
<b>[Course objectives]</b>						
化学研究における単結晶X線結晶構造解析の意味を理解し、その結果について考察ができるようになる。						
<b>[Course schedule and contents]</b>						
1 . X線結晶構造解析とは 2 . X線結晶構造解析の原理 3 . X線結晶構造解析の基礎 4 . 結晶の作り方、選び方 5 . X線回折・測定 6 . X線結晶構造解析 7 . X線結晶構造解析の結果の評価 8 . 難しい解析・注意点 9 . まとめ 1 0 . X線結晶構造解析の実例・デモンストレーション 1 1 . 確認テストと演習						
<b>[Course requirements]</b>						
一般的な有機化学および無機化学に関する知識を有する。						
<b>[Evaluation methods and policy]</b>						
小テスト50%、レポート課題50%						
<b>[Textbooks]</b>						
資料を配付する。						
<b>[References, etc.]</b>						
( Reference books )						
平山 令明著 「第2版化学・薬学のためのX線解析入門」 丸善 2006年(第2版)						
Continue to 物質エネルギー化学特論第五(2)						

物質エネルギー化学特論第五(2)

**[Study outside of class (preparation and review)]**

必要に応じて連絡する。

**( Other information (office hours, etc.) )**

メール連絡：sasamori@chem.tsukuba.ac.jp

( かならず、ご本人の名前と所属を記載した上でメール連絡をお願いいたします。 )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG13 7H238 LJ60					
<b>Course title (and course title in English)</b>	放射化学特論 Radiochemistry, Adv.			<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Radiation and Nuclear Science Associate Professor, OKI YUUCHI Institute for Integrated Radiation and Nuclear Science Associate Professor, TAKAMIYA KOUICHI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester		
<b>Days and periods</b>	Wed.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese		
<b>[Overview and purpose of the course]</b>							
<b>[Course objectives]</b>							
<b>[Course schedule and contents]</b>							
,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,2times,							
<b>[Course requirements]</b>							
None							
<b>[Evaluation methods and policy]</b>							
<b>[Textbooks]</b>							
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Continue to 放射化学特論(2)							



## 放射化学特論(2)

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG13 6H240 LJ60				
<b>Course title (and course title in English)</b>	有機典型元素化学 Organic Main-Group Element Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Integrated Cell-Material Sciences Professor, FUKAZAWA AIKO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>広範な有機化学の中でも，多彩な典型元素の導入がもたらす特徴的な反応性，物性，機能に焦点を当て，その基盤となる原理，基礎知識を講述する。本講義を通して，元素の特徴の理解を通して有機化学を多角的に捉える機会を提供する。また，当該分野の最先端研究を，講義で習得した知識を総動員して読み解くことで，新しい分野の開拓につながる視点を涵養する。</p>					
<b>[Course objectives]</b>					
<p>有機典型元素化合物の構造や反応性，物性の理解を理解する。また，元素ごとの各論の学習にとどまらず，あらゆる元素に共通する概念や主導原理を理解し，元素の特徴を俯瞰する力を習得する。有機化学と無機化学の境界に位置する有機典型元素化合物の化学の学習を通して，学問分野や研究を多角的に捉える力を養う。</p>					
<b>[Course schedule and contents]</b>					
<ul style="list-style-type: none"> <li>・概論（１） 講義内容の概要説明と授業の進め方の説明を行う。</li> <li>・有機典型元素化合物の基本的な特徴（１）原子半径や電気陰性度などの基本的な元素の特性に基づき，典型元素の導入が有機化合物にもたらす電子効果を説明する。</li> <li>・有機ケイ素化合物の反応性と構造論（３）有機ケイ素化合物をモデルに，有機化合物との反応性や構造の比較を通して，第2周期元素と第3周期以降の元素の本質的な違いを説明する。</li> <li>・様々な有機典型元素化合物の構造論と反応性（２）様々な有機典型元素化合物の構造や反応性を，酸・塩基性，軌道相互作用，高配位形成といった視点に基づき横断的に解説する。</li> <li>・有機典型元素化合物の物性と機能（３）典型元素の導入が有機化合物にもたらす特異な物性や機能について，最新の研究例を交えて説明する。</li> <li>・学修到達度の確認(1) 学習到達度の確認を行う。</li> </ul>					
<b>[Course requirements]</b>					
有機化学，無機化学などの学部科目（化学系）の履修を前提とする。					
<b>[Evaluation methods and policy]</b>					
レポートにより行う。					
Continue to 有機典型元素化学(2)					

## 有機典型元素化学(2)

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### [Textbooks]

必要に応じて講義資料を配布

### [References, etc.]

#### ( Reference books )

野依，柴崎，鈴木，玉尾，中筋，奈良坂編『大学院講義有機化学Ⅰ』（東京化学同人）

### [Study outside of class (preparation and review)]

講義資料による予習・復習を充分行うこと。

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG43 6S204 LJ60				
<b>Course title (and course title in English)</b>	物質エネルギー化学特別セミナー 1 Energy and Hydrocarbon Chemistry Special Seminar 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAGEYAMA HIROSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG43 6S205 LJ60					
<b>Course title (and course title in English)</b>	物質エネルギー化学特別セミナー 2 Energy and Hydrocarbon Chemistry Special Seminar 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAGEYAMA HIROSHI Graduate School of Engineering Associate Professor, MIKI KOUJI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times, ” ”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG13 6S206 LJ60					
<b>Course title (and course title in English)</b>	物質エネルギー化学特別セミナー 3 Energy and Hydrocarbon Chemistry Special Seminar 3		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAGEYAMA HIROSHI Graduate School of Engineering Associate Professor, MIKI KOUJI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 6D432 EJ60					
<b>Course title (and course title in English)</b>	分子工学特別実験及演習 Laboratory and Exercises in Molecular Engineering I			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,7times, ,16times, ,7times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 6D433 EJ60					
<b>Course title (and course title in English)</b>	分子工学特別実験及演習 Laboratory and Exercises in Molecular Engineering II			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,7times, ,16times, ,7times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG14 6D440 LB60				
<b>Course title (and course title in English)</b>	分子工学特論第二A Molecular Engineering, Adv. IIA		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,8times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG14 6D447 LB60					
<b>Course title (and course title in English)</b>	分子工学特論第二B Molecular Engineering, Adv. IIB			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,8times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 5H401 LJ60					
<b>Course title (and course title in English)</b>	統計熱力学 Statistical Thermodynamics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SATO HIROFUMI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Many of our surrounding substances are condensed systems in which countless molecules are gathered. In this lecture, we aim to understand the behaviors of various condensing systems from the viewpoint of statistical mechanics. Starting from the basics of statistical mechanics, we learn statistical mechanics handling of realistic molecular system.						
<b>[Course objectives]</b>						
Confirm the relationship between thermodynamics and statistical mechanics, and acquire statistical mechanics ideas to understand various phenomena as well.						
<b>[Course schedule and contents]</b>						
Fundamentals of statistical mechanics (3times) cumulant, phase space, micro canonical ensemble, grand canonical ensemble  Fundamentals of statistical mechanics of quantum system (3times) Fermi statistics, Bose statistics  Interacting classical system (5times) imperfect gas, cluster expansion, functional derivative, distribution function, integral equation theory for liquids						
<b>[Course requirements]</b>						
Knowledge of thermodynamics of undergraduate level and elementary statistical mechanics						
<b>[Evaluation methods and policy]</b>						
Evaluation will be based on active participation and an examination.						
<b>[Textbooks]</b>						
Instructed during class						
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Continue to 統計熱力学(2)						

## 統計熱力学(2)

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

While studying the thermodynamics and underlying statistical mechanics in the physics chemistry lecture of undergraduate, we recommend that you review it as necessary as the lecture progresses.

### ( Other information (office hours, etc.) )

The content of the lecture may be revised as necessary according to the situation of participants.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG14 5H406 LJ60				
<b>Course title (and course title in English)</b>	量子化学 Quantum Chemistry II			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,HIGASHI MASAHIRO Graduate School of Engineering Senior Lecturer,Nguyen Thanh Phuc Graduate School of Engineering Program-Specific Assistant Professor,FUJIHASHI YUTA Graduate School of Engineering Professor,SATO HIROFUMI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,3times, ,2times, ,2times, ,1time, ,2times, ,1time, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 6H416 LJ60 G-ENG14 6H416 LE60				
<b>Course title (and course title in English)</b>	分子触媒学 Catalysis Science at Molecular Level		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TANAKA TSUNEHIO Graduate School of Engineering Professor, TERAMURA KENTARO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Scattering theory of an electron for XAFS Analysis and Introduction to Catalytic Science. The lectures are delivered online.					
<b>[Course objectives]</b>					
Learning fundamentals of catalytic science and acquiring elementary scattering theory to understand XAFS spectroscopy as a powerful tool for catalyst characterization.					
<b>[Course schedule and contents]</b>					
1 Solving Schroedinger equation in central force field (2) variable separation method; angular momentum; radial equation; solution for bound condition; solution for scattering condition  2 Hydrogen-like atom problem in two dimension(1) Schroedinger equation of hydrogen-like atom in two dimension is solved according to the solution in lecture 1.  3 Fermi's golden rule(1) perturbation theory (non-degenerated system); time dependent Shroedinger equation; time-dependent pertubation theory  4 EXAFS Analysis(1) EXAFS analysis  5 Application of EXAFS(1) examples and recent topics  6 Introduction to catalytic science(1) fundamentals of catalyst and catalysis; design of catalysts  7 Introduction to photocatalysis(1) fundamentals of photocatalyst and photocatalysis  8 Industrial catalysis(1) catalysts for petroleum chemistry  9 Chemistry of adsorption(1)					
----- Continue to 分子触媒学(2) -----					

## 分子触媒学(2)

physisorption and chemisorption

10 Physical chemistry for catalysis(1)  
thermodynamics and reaction kinetics in catalysis.

11 Feed back(1)

### [Course requirements]

Knowledge of physical chemistry like quantum chemistry, thermodynamics and spectroscopy is preferred.

### [Evaluation methods and policy]

Absolute evaluation

Students will submit assignments to profs. Tanaka and Teramura and evaluation will be done on the basis of the total scores given by each professor.

### [Textbooks]

No text book.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Submission of solution of problems shown at the end of several classes and of report assignment on a recent scientific paper of catalysis.

### ( Other information (office hours, etc.) )

Students ask questions and comments anytime via e-mail. If necessary, interview will be made via online or face-to-face under sufficient infection control.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG14 6H417 LJ60				
<b>Course title (and course title in English)</b>	分子光化学 Molecular Photochemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, IMAHORI HIROSHI Graduate School of Engineering Associate Professor, HIGASHINO TOMOHIRO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Basic concepts and examples on photochemistry and solar energy conversion will be given.					
<b>[Course objectives]</b>					
Basic concepts and practical examples given in each class should be fully understood so that attendees can apply them to real systems.					
<b>[Course schedule and contents]</b>					
1) Basic photochemistry, 1 time, Absorption and Emission 2) Photophysical processes, 1 time, Jabronski diagram 3) Photochemical processes, 1 time, Photochemical reactions 4) Electron transfer, 1 time, Marcus theory for electron transfer 5) Energy transfer, 1 time, Forster and Dexter energy transfer 6) Electron transfer in model systems, 1 time, Dependence of driving force, electronic coupling, and reorganization energy, 1 time, 7) Electron transfer in assembly systems, 1 time, LB films and self-assembled monolayers 8) Natural photosynthesis, 1 time, Light-harvesting, charge separation, and proton transfer across membrane, and water oxidation 9) Organic photovoltaics, 1 time, Dye-sensitized solar cells and bulk heterojunction solar cells 10) Solar energy conversion, 1 time, Photocatalysts and solar fuels 11) Feedback, 1 time					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Grading will be done on a basis of written exam.					
Continue to 分子光化学(2)					



## 分子光化学(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

References on photochemistry and solar energy conversion given in each class should be read to deepen attendee's knowledge and expertise.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG43 5H423 LJ57   G-ENG43 5H423 LJ53   G-ENG14 5H423 LJ60 G-ENG14 5H423 LJ57   G-ENG14 5H423 LJ53   G-ENG43 5H423 LJ60			
<b>Course title (and course title in English)</b>	物性物理化学 Condensed Matter Physical Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, Shu Seki Graduate School of Engineering Associate Professor, SUDA MASAYUKI Graduate School of Engineering Associate Professor, TANAKA TAKAYUKI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Solid State Physics, as well as Condensed Matter Physical Chemistry, have been developed successively to address Properties of Matter quantitatively. We seldom face a “ new ” physical property because our human beings have been always associated with the Matters, and the needs for understanding the properties of the matters have been also mandatory to live in any situations; thus finding and claiming “ a new physical property ” of matters are very challenging, exceptional, and extraordinary case for scientists. Let us consider on conventional thermal properties, electrical (electronic) properties, optical properties, and magnetic properties. In any properties, they are discussed in terms of their corresponding quantitative values with physical units. A “ new physical property ” should be associated with the values with unique physical unit, and this is implying “ a new physical property ” as an extraordinary one. Our scientists have to be prepared when one claim on the finding of “ a new physical property ” .</p> <p>Herein this classes of Condensed Matter Physical Properties, we will start from a simple model of materials, molecules, and chemical substances as a platform for the further discussions on their physical properties, going to the representation of the physical properties, particularly of structural properties, electronic properties, thermal properties, and magnetic properties. How the properties can be controlled by a specific parameter of the matter, how the parameters correlate with each other; those concepts will be in your mind in this classes via a variety of assessment techniques of the physical properties.</p>					
<b>[Course objectives]</b>					
<p>Based on fundamental physical chemistry concepts,</p> <ol style="list-style-type: none"> <li>1) Understanding intercorrelation between geometrical “ structures ” and macroscopic properties of matters with the model of macromolecular chains.</li> <li>2) Understanding electric (electronic) properties of molecular materials: Starting from simple electronic band theory and electron transport.</li> <li>3) Understanding thermophysical properties of materials: Starting from simple quantized lattice vibration (Debye) model and specific heat</li> <li>4) Understanding of magnetism: Starting from simple band theory, Hubbard model and Stoner model</li> </ol> <p>Interaction of electromagnetic waves and/or ionizing radiations provides the fundamental basis of any assessment techniques of physical properties discussed in the classes.</p>					
<b>[Course schedule and contents]</b>					
<ol style="list-style-type: none"> <li>1. Principles of interactions between matters and lights/electromagnetic waves/ionizing radiations</li> <li>2. Theory of cross-sections</li> <li>3. Theory of cross-sections 2: classical/quantum Fermi golden rules 1</li> <li>4. classical/quantum Fermi golden rules 2</li> </ol>					
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Continue to 物性物理化学(2)					

## 物性物理化学(2)

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5. Electron transport in matters and the assessment techniques
  6. Classical free electron theory (Drude model)
  7. Quantization of lattice vibration and specific heat
  8. Free electron fermi gas model
  9. Wave nature of electrons and reciprocal space
  10. Bloch states and band theory
  11. (Particulars; Magnetism, Spin-related Properties, Superconductivity etc.)

### [Course requirements]

None

### [Evaluation methods and policy]

Report and Question Papers

### [Textbooks]

None

### [References, etc.]

#### ( Reference books )

Shu Seki 『High Energy Charged Particles: Their Chemistry and Use as Versatile Tools for Nanofabrication』  
( Springer 2015 ) ISBN:978-4-431-55683-1  
アシュクロフト・マーミン 『固体物理の基礎 ( 上・下、 ・ ) 』 ( 吉岡書店 1981 ) ISBN:978-4842701981, 978-4842701998, 978-4842702025, 978-4842703473

### [Study outside of class (preparation and review)]

Instruct if necessary

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG14 7H436 LJ60					
<b>Course title (and course title in English)</b>	分子工学特論第三 Molecular Engineering, Adv. III			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,5.5times, ,5.5times, ,5.5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 6P416 LJ60					
<b>Course title (and course title in English)</b>	分子触媒学続論 Catalysis Science at Molecular Level 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TANAKA TSUNEHIRO Graduate School of Engineering Professor,TERAMURA KENTARO		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
Lectures on various inorganic syntheses and characterization of inorganic materials are given mainly by Professor Saburo Hosokawa. In addition, application of inorganic materials to heterogeneous catalyst is described.						
<b>[Course objectives]</b>						
Learning the fundamentals of catalyst preparation and the method for structural analysis of catalyst materials						
<b>[Course schedule and contents]</b>						
1 Synthesis methods of inorganic materials(1) co-precipitation method; polymerized complex method; solvothermal method  2 Characterization of inorganic materials(2) XRD(X-ray Diffraction); XAFS(X-ray Absorption Fine Structure); IR (Infrared spectroscopy); TPR(Temperature programmed reduction)  3 Catalysis by inorganic materials(1) Environmental catalysts like automotive catalysts for purification of exhaust gas.						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Submission of report assignment.						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Introduced during class						
<b>[Study outside of class (preparation and review)]</b>						
Instructions will be given as necessary.						
( <b>Other information (office hours, etc.)</b> )						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 7P417 LJ60					
<b>Course title (and course title in English)</b>	分子光化学続論 Molecular Photochemistry 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, IMAHORI HIROSHI Graduate School of Engineering Associate Professor, HIGASHINO TOMOHIRO		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
We will discuss the photoinduced energy and electron transfer dynamics in molecular systems						
<b>[Course objectives]</b>						
To understand the photoinduced energy and electron transfer dynamics in molecular systems						
<b>[Course schedule and contents]</b>						
Introduction, 1 times, Introduction to excited-state dynamics in molecular systems Laser spectroscopic methods, 1 times, Description to steady-state and time-resolved laser spectroscopic methods to study excited-state dynamics Photoinduced Energy Transfer, 1 times, Description of photoinduced energy transfer dynamics, case studies of photoinduced energy transfer processes Photoinduced Energy Transfer, 1 times, Description of photoinduced electron transfer dynamics, case studies of photoinduced electron transfer processes						
<b>[Course requirements]</b>						
Undergraduate level of Physical Chemistry and English						
<b>[Evaluation methods and policy]</b>						
By the final report (95%) + class participation and attendance (5%)						
<b>[Textbooks]</b>						
No textbook						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Modern Molecular Photochemistry (by N. Turro)						
( <b>Related URLs</b> ) ( <a href="https://park-group.wixsite.com/park-group">https://park-group.wixsite.com/park-group</a> )						
<b>[Study outside of class (preparation and review)]</b>						
It will be given doing the course.						
( <b>Other information (office hours, etc.)</b> )						
This course will be opened every two years and will not be available in 2017 fiscal year. Office hour: (Location and Time: Katsura campus, A4-205, appointment by email) Instructor: Jaehong Park (email: j.park@moleng.kyoto-u.ac.jp)						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 7P439 LB60					
<b>Course title (and course title in English)</b>	分子工学特論第六 Molecular Engineering, Adv. VI			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO Graduate School of Engineering Assistant Professor, MORIMOTO DAICHI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG44 6S401 LJ60					
<b>Course title (and course title in English)</b>	分子工学特論 Advanced Molecular Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times, ”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG44 7S404 SJ60				
<b>Course title (and course title in English)</b>	分子工学特別セミナー 1 Advanced Seminar on Molecular Engineering 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG44 7S404 SJ60					
<b>Course title (and course title in English)</b>	分子工学特別セミナー 2 Advanced Seminar on Molecular Engineering 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TERAMURA KENTARO		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG15 6D640 EJ61					
<b>Course title (and course title in English)</b>	高分子化学特別実験及演習 Polymer Chemistry Laboratory & Exercise			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KOGA TSUYOSHI	
<b>Target year</b>		<b>Number of credits</b>	8	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,60times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG15 5D652 LJ61				
<b>Course title (and course title in English)</b>	高分子物性 Polymer Physical Properties		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAMURA YOU Graduate School of Engineering Professor, TAKENAKA MIKIHITO Graduate School of Engineering Professor, KOGA TSUYOSHI Graduate School of Engineering Assistant Professor, TAMAI YASUNARI	
<b>Target year</b>		<b>Number of credits</b>	3	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.1,2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
A concise explanation is given of physical properties of polymer solutions and polymeric solids along with relevant basic theories.					
<b>[Course objectives]</b>					
Fundamental knowledge of physical properties of polymer materials.					
<b>[Course schedule and contents]</b>					
<p>Polymer Chain Conformation in Dilute Solutions, 4 times, After a clarification of basic factors which determine the conformations of real polymer chains in dilute solutions, some polymer chain models are introduced to describe the equilibrium conformational behavior of the real chains. Further, behavior of average chain dimensions as a function of molecular weight is considered based on the chain models.</p> <p>Thermodynamics and Phase Behavior of Polymer Solutions, 4 times, Various phase transition phenomena in polymer solutions (phase separation, hydration, association, gelation, etc.) are systematically explained from thermodynamic and statistical-mechanical viewpoints. Phase separation of polymer solutions, Aqueous polymer solutions, and Association and gelation of polymers are discussed in the lectures.</p> <p>Exercise, 1 time, Exercise in polymer solutions.</p> <p>Structure and Mechanical Properties of Polymeric Solids, 5 times, Polymeric solids such as rubber and plastics, especially thermodynamics of rubber elasticity, polymer crystallization and crystalline/amorphous higher-order structures, are discussed. Moreover, fundamentals of viscoelastic properties of polymers are introduced to provide the understandings of relaxation phenomena such as glass transition.</p> <p>Electronic and Optical Properties of Polymeric Solids, 5 times, The electronic and optical properties of polymers is reviewed. The application of polymer materials in the opto-electronics and display devices is also presented.</p> <p>Exercise, 1 time, Exercise in polymeric solids.</p>					
<b>[Course requirements]</b>					
Fundamental knowledge of physical chemistry.					
Continue to 高分子物性(2)					

## 高分子物性(2)

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### [Evaluation methods and policy]

Final grades will be evaluated in a comprehensive manner on the basis of attendance, reports, and examinations.

### [Textbooks]

Lecture notes distributed in the class.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Reading the distributed texts.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H607 LJ61					
<b>Course title (and course title in English)</b>	高分子生成論 Design of Polymerization Reactions		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OUCHI MAKOTO		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,3times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG15 6H610 LJ61			
<b>Course title (and course title in English)</b>	反応性高分子 Reactive Polymers		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Global Environmental Studies Professor, TANAKA KAZUO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
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Continue to 反応性高分子(2)					

反応性高分子(2)

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[Study outside of class (preparation and review)]

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG15 6H611 LJ61					
<b>Course title (and course title in English)</b>	生体機能高分子 Biomacromolecular Science		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AKIYOSHI KAZUNARI Graduate School of Engineering Associate Professor, YOSHIHIRO SASAKI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
, 5 times, , 3 times, , 3 times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG15 6H613 LJ61				
<b>Course title (and course title in English)</b>	高分子機能学 Polymer Structure and Function		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOKITA HIDEO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In this class, optoelectronic functions of polymeric materials are discussed on the basis of photochemistry and photophysics. In particular, the importance of designing nanostructures of polymer assembly is highlighted by explaining examples of state-of-the-art applications, which include optical fibers, organic light-emitting diode, and organic solar cells.					
<b>[Course objectives]</b>					
Students will gain an understanding of the importance of polymer materials and nano-assembled structures that support polymer functions. Students will also foster their abilities to consider advanced functional materials on the basis of fundamental knowledge of polymer chemistry and photochemistry.					
<b>[Course schedule and contents]</b>					
<p>Course overview (1 class) Explanation is made of fields in contemporary society in which polymeric functional materials are actively utilized. The overall orientation of this course is also overviewed.</p> <p>Conductive functions of polymers (3 classes) Detailed explanation is made of the basic electronic properties of polymers, including conductive polymers, polymer semiconductors, etc. Functions of such polymer materials are found in the organic electronics field, including photoconductive materials and thin-film transistors.</p> <p>Optoelectronic functions of polymers (4 classes) Explanation is made of the development of optical function polymers, photoexcitation dynamics, and basic processes of photochemistry, together with optical functions used in related applications. Fundamentals concerning the optical properties of polymer materials are discussed, as well as polymer-related developments in the optics field.</p> <p>Photovoltaic conversion functions of polymers (3 classes) The importance of electron transfer is explained using as an example energy conversion in photosynthesis systems. Also described are application developments in organic photovoltaics (OPV) and organic light-emitting diodes (OLED), etc., which convert light into electricity, and electricity into light.</p>					
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Continue to 高分子機能学(2)					

## 高分子機能学(2)

### **[Course requirements]**

As prerequisites for this course, students are to have completed courses in physical chemistry and polymer chemistry in the faculty of engineering chemistry.

### **[Evaluation methods and policy]**

#### **【 Evaluation method 】**

Evaluation will be based on reports (80%) and class performance (20%).  
- Those who are absent more than half will not be credited.

#### **【 Evaluation policy 】**

Achievement of goals is evaluated according to the grade evaluation policy of the graduate.

### **[Textbooks]**

Copies of lecture notes will be distributed and used in classes.

### **[References, etc.]**

#### **( Reference books )**

None:

### **[Study outside of class (preparation and review)]**

Students are to review distributed copies of lecture materials and perform review study in relevant domains.

### **( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H616 LJ61				
<b>Course title (and course title in English)</b>	高分子集合体構造 Polymer Supramolecular Structure		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKENAKA MIKIHITO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Polymers self-assemble or self-organize by intra- and/or intermolecular interaction to form assembled structures of polymer molecules. Such structures are closely related to the properties of the polymeric materials, it is necessary to control the assembled structures of the constituent polymer molecules in order to control the properties of polymeric materials, especially solid materials. In this lecture particularly, formation mechanisms, analytical techniques, and elucidated structures of crystalline polymers, phase-separated structures of polymer mixtures, microphase-separated structures of block and graft copolymers will be discussed.					
<b>[Course objectives]</b>					
This course aims for the development of the faculty to infer the properties of polymeric materials from their morphology based on the knowledge of structure-property relationships of higher-order structures of crystalline polymers, phase-separated structures of polymer mixtures (blends), microdomain structures of block copolymers, etc.					
<b>[Course schedule and contents]</b>					
Self-assembly and Self-organization, 1time, The differences between self-assembly and self-organization will be discussed by referring the examples in natural phenomena and polymeric systems. Crystalline Polymers, 3times, In the lectures, unit cell structures and hierarchical higher-order structures of polymer crystals such as folded-chain lamellar crystals and spherulites, as well as deformation and thermal behavior of polymer crystals will be discussed. Polymer Blends, 3times, Miscibility, phase-diagrams, mechanisms and dynamics of phase transitions, relationships between phase-separated structures and properties, methods to control the phase-separated structures will be discussed. Block and Graft Copolymers, 3times, The lectures include nano-scale domain formation of block copolymers by microphase-separation, miscibility and phase diagrams, order-disorder and order-order transitions, bicontinuous structures, structure formation in thin films, blends with homopolymers or other block copolymers, multi-component multi-block copolymers, miktoarm star block copolymers, and more. Evaluation of Degree of Understandings, 1time, Degree of understandings of the lectures will be evaluated by means of a short test and group discussions.					
<b>[Course requirements]</b>					
Thermodynamics preferable.					
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Continue to 高分子集合体構造(2)					

## 高分子集合体構造(2)

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### [Evaluation methods and policy]

The grading is based on the short tests and report assignments.

### [Textbooks]

Not used.

### [References, etc.]

#### ( Reference books )

Introduced in the lectures.

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H622 LJ61				
<b>Course title (and course title in English)</b>	高分子基礎物理化学 Fundamental Physical Chemistry of Polymers		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KOGA TSUYOSHI Graduate School of Engineering Associate Professor,NISHIDA KOUJI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Molecular mechanism of characteristic physical properties of polymeric systems is lectured on the basis of the equilibrium and non-equilibrium statistical mechanics. Main topics are phase separation of polymer solutions and mixtures, microphase separation of block copolymers, gelation, rubber elasticity, and rheology of physical gels.					
<b>[Course objectives]</b>					
Understanding the molecular mechanism of characteristic physical properties of polymeric systems based on the equilibrium and non-equilibrium statistical mechanics.					
<b>[Course schedule and contents]</b>					
phase separation of polymer solutions and mixtures,3times,phase diagram, Flory-Huggins theory, mean-field theory, phase separation, spinodal decomposition microphase separation of block copolymers,3times,microphase separation, density functional theory, directed self-assembly structure and property of polyelectrolyte solution,2times,electrostatic interaction between polyions, screening effects, dilute and semi-dilute solutions vibrational mode and spectroscopy of polymer solid,2times,vibration of continuous medium, vibration of polymer chain, spectroscopic experiment					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
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Continue to 高分子基礎物理化学(2)					

## 高分子基礎物理化学(2)

### [References, etc.]

#### ( Reference books )

P.J. Flory, Principles of Polymer Chemistry (Cornell Univ. Press, New York, 1955) M. Rubinstein, R.H. Colby, Polymer Physics (Oxford Univ. Press, New York, 2003)

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H628 LJ61 G-ENG15 6H628 LE61				
<b>Course title (and course title in English)</b>	高分子材料設計 Design of Polymer Materials		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Chemical Research Professor, TSUJII YOSHINOBU	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course aims at better understanding of fundamentals on living radical polymerization and describes its application to graft polymerization for novel surface modification as well as its related matters.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Introduction to radical polymerization, 1time, radical polymerization, mechanism, kinetics, elementary reaction Fundamentals on living radical polymerization and its application to material design, 2times, living radical polymerization, mechanism, kinetics, functional polymer, material design Physical chemistry on surfaces and polymer brushes, 2times, Surface, interface, physical chemistry, polymer brush, theory, structure, property Living radical polymerization and polymer particles, 2times, Living radical polymerization, surface-initiated polymerization, polymer brush, hairy particle, star polymer Synthesis of polymer particles by radical polymerizations, 2times, Emulsion polymerization, suspension polymerization, dispersion polymerization, precipitation polymerization, self-organized precipitation, nonspherical particle Applications of polymer particles, 2times, Self-assembly, dispersion and aggregation, depletion force, pickering emulsion, composites, biochemical and biomedical applications					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
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Continue to 高分子材料設計(2)					



## 高分子材料設計(2)

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**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H636 LJ61				
<b>Course title (and course title in English)</b>	医薬用高分子設計学 Polymer Design for Biomedical		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Life and Medical Sciences Professor, TABATA YASUHIKO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>外科および薬物治療、予防、診断など、現在の医療現場では、種々の生体吸収性および非吸収性の高分子材料が用いられている。本講では、これらの材料を設計する上で必要となる材料学的基礎と生物、薬学、医歯学的な基礎事項について講述する。さらに、高分子材料を用いたドラッグデリバリーシステム(DDS)あるいは再生医療への応用についても概説する。</p>					
<b>[Course objectives]</b>					
<p>バイオマテリアル(生体材料)とは何か、医薬用高分子設計学におけるバイオマテリアル技術の役割が理解できる。</p>					
<b>[Course schedule and contents]</b>					
<p>概論(1回) 現在の外科・内科治療で用いられている材料について、具体例を示しながら概説するとともに、授業全体の流れと扱う内容について説明する。人工血管、人工腎臓、人工肝臓、創傷被覆材、生体吸収性縫合糸などの実物を見ることによって、高分子材料が大きく医療に貢献していることを実感してもらう。</p> <p>生体吸収性および非吸収性材料(2回) 医療に用いられている生体吸収性および非吸収性高分子、ならびに金属やセラミックスなどの材料について説明する。</p> <p>医薬用高分子設計のための生物医学の基礎知識(1回) 医薬用高分子材料を設計する上で必要となる材料と生体との相互作用を理解するための最低限の基礎知識、すなわちタンパク質、細胞、組織などについて説明する。</p> <p>抗血栓性材料(1回) 血液がかたまらない性質(抗血栓性)をもつ材料を説明することによって、生体と材料との相互作用についての理解を深めるとともに、材料の研究手法と設計方法を学ぶ。</p> <p>生体適合性材料(1回) 細胞がなじむ(細胞親和性)や組織になじむ(組織適合性)をもつ材料を説明することによって、生体と材料との相互作用についての理解を深め、材料の研究手法と設計方法を学ぶ。</p> <p>ドラッグデリバリーシステム(DDS)のための生物薬学の基礎知識(1回) ドラッグデリバリーシステム(DDS)のための材料設計を行う上で必要となる最低限の医学、薬学知識について説明する。</p>					
<p style="text-align: right;">Continue to 医薬用高分子設計学(2)</p>					

## 医薬用高分子設計学(2)

### ドラッグデリバリーシステム(DDS)(2回)

薬の徐放化、薬の安定化、薬の吸収促進、および薬のターゲティングなどのDDSの具体例を示しながら、DDSのための材料の必要性を理解させ、材料の研究手法や設計方法を学ぶ。

### 再生医療(2回)

再生誘導治療（一般には再生医療と呼ばれる）の最前線について説明する。再生医療には細胞移植による生体組織の再生誘導と生体吸収性材料とDDSとを組み合わせる生体組織の再生を誘導する（生体組織工学、Tissue Engineering）の2つがある。これらの具体的を示しながら、再生医療における材料学の重要な役割について説明する。

### [Course requirements]

京都大学工学部工業化学科「高分子化学基礎I（創成化学）」程度の高分子合成と物性に関する入門的講義の履修を前提としている。

### [Evaluation methods and policy]

医薬用高分子に関する講義内容の理解度の判定を目的に、成績評価は、出席状況と試験により行うことを基本とする。

### [Textbooks]

授業で配布する講義プリントを使用する。

### [References, etc.]

（Reference books）

### [Study outside of class (preparation and review)]

必要に応じて指示する。

### （Other information (office hours, etc.)）

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H643 LJ61				
<b>Course title (and course title in English)</b>	高分子溶液学 Polymer Solution Science		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAMURA YOU Graduate School of Engineering Associate Professor, IDA DAICHI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Effects of stiffness and local conformations of polymer chains on polymer solution properties observed in the light scattering and viscosity experiments are considered based on appropriate polymer chain models.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
<p>Review, 1time, Definitions of physical quantities determined from the light scattering and viscosity measurements and the theoretical formulations of those quantities.</p> <p>Experiments in dilute polymer solutions, 2times, Principles of the light scattering and viscosity experiments. Polymer chain models and their statistics, 2times, Static models for polymer chains: the Gaussian chain, the wormlike chain, and the helical wormlike chain. A comparison of experimental data for the mean-square radius of gyration with relevant theories.</p> <p>Excluded-volume effects, 2times, Intra- and intermolecular excluded-volume effects represented by the expansion factors and the second virial coefficient, respectively.</p> <p>Steady-state transport properties, 2times, A comparison of experimental data for the intrinsic viscosity and diffusion coefficient with relevant theories.</p> <p>Dynamic properties, 2times, Dynamic models for polymer chains: the Rouse-Zimm spring-bead model and the dynamic helical wormlike chain. A comparison of experimental data for the first cumulant of the dynamic structure factor with relevant theories.</p>					
<b>[Course requirements]</b>					
Basic knowledge of polymer solutions given in the lecture Polymer Physical Properties (10D651).					
<b>[Evaluation methods and policy]</b>					
Term-end examination.					
<b>[Textbooks]</b>					
Lecture note distributed in the class.					
<b>[References, etc.]</b>					
( Reference books )					
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Continue to 高分子溶液学(2)					

## 高分子溶液学(2)

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**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H645 LJ61				
<b>Course title (and course title in English)</b>	高分子機能化学 Polymer Functional Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SUGIYASU KAZUNORI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
超分子化学と高分子化学の境界領域で生み出されている新しい物質・材料について、そのコンセプトを学ぶ。					
<b>[Course objectives]</b>					
機能性高分子の設計、合成、物性、機能に関する基本的な内容を習熟させることを目標とする。基本的なコンセプトを学び、自身で機能性高分子を設計できるようになることを目指す。					
<b>[Course schedule and contents]</b>					
超分子化学の基礎（２回） 分子間相互作用；平衡定数；分子機械；人工酵素；センサー；トポロジーなど					
超分子ポリマー（２回） 物性と機能；重合メカニズム；精密合成など					
超分子と高分子の融合（２回） 自己修復性材料；環動ゲル；分解性ポリマー；動的共有結合ポリマー；力学応答など					
特殊構造高分子（１回） dendrimer；らせんポリマー；環状ポリマー；ポリロタキサンなど					
超分子化学と高分子化学の関わり：歴史的な観点から（１回）					
有機エレクトロニクス（２回） 有機半導体；発光性材料など					
達成度評価：レポートのディスカッション（１回）					
<b>[Course requirements]</b>					
京都大学工学部工業化学科「高分子化学基礎I（創成化学）」程度の高分子化学に関する入門的講義の履修を前提としている。					
<b>[Evaluation methods and policy]</b>					
【評価方法】 レポート試験の成績（７０％）、平常点評価（３０％）					
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Continue to 高分子機能化学(2)					

## 高分子機能化学(2)

・ 半数以上授業を欠席した場合には、単位を認めない。

### 【評価方針】

到達目標について、工学研究科の成績評価の方針にしたがって評価する。

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

授業中に指示する

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H647 LJ61					
<b>Course title (and course title in English)</b>	高分子制御合成 Polymer Controlled Synthesis		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Chemical Research Professor, YAMAGO SHIGERU Institute for Chemical Research Associate Professor, TOSAKA MASATOSHI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,2times, ,1time, ,1time, ,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>		G-ENG15 5H649 LJ61			
<b>Course title (and course title in English)</b>	高分子合成 Polymer Synthesis		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,AKIYOSHI KAZUNARI	
				Graduate School of Engineering Professor,OOUCHI MAKOTO Graduate School of Global Environmental Studies Professor,TANAKA KAZUO Graduate School of Engineering Professor,SUGIYASU KAZUNORI Graduate School of Engineering Associate Professor,TERASHIMA TAKAYA Graduate School of Engineering Assistant Professor,SAWADA SHINICHI Graduate School of Engineering Associate Professor,YOSHIHIRO SASAKI Graduate School of Global Environmental Studies Assistant Professor,GON MASAYUKI Graduate School of Engineering Senior Lecturer,LANDENBERGER, Kira Beth Graduate School of Engineering Assistant Professor,NISHIKAWA TSUYOSHI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time,					
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Continue to 高分子合成(2)					

## 高分子合成(2)

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### [Course requirements]

None

### [Evaluation methods and policy]

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG45 6H650 LJ61				
<b>Course title (and course title in English)</b>	高分子機能化学特論 Polymer Functional Chemistry, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SUGIYASU KAZUNORI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
超分子化学と高分子化学の境界領域で生み出されている新しい物質・材料について、そのコンセプトを学ぶ。					
<b>[Course objectives]</b>					
機能性高分子の設計、合成、物性、機能に関する基本的な内容を習熟させることを目標とする。基本的なコンセプトを学び、自身で機能性高分子を設計できるようになることを目指す。					
<b>[Course schedule and contents]</b>					
超分子化学の基礎（２回） 分子間相互作用；平衡定数；分子機械；人工酵素；センサー；トポロジーなど					
超分子ポリマー（２回） 物性と機能；重合メカニズム；精密合成など					
超分子と高分子の融合（２回） 自己修復性材料；環動ゲル；分解性ポリマー；動的共有結合ポリマー；力学応答など					
特殊構造高分子（１回） デンドリマー；らせんポリマー；環状ポリマー；ポリロタキサンなど					
超分子化学と高分子化学の関わり：歴史的な観点から（１回）					
有機エレクトロニクス（２回） 有機半導体；発光性材料など					
達成度評価：レポートのディスカッション（１回）					
<b>[Course requirements]</b>					
京都大学工学部工業化学科「高分子化学基礎I（創成化学）」程度の高分子化学に関する入門的講義の履修を前提としている。					
<b>[Evaluation methods and policy]</b>					
【評価方法】 レポート試験の成績（７０％）、平常点評価（３０％） ・半数以上授業を欠席した場合には、単位を認めない。					
Continue to 高分子機能化学特論(2)					

## 高分子機能化学特論(2)

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### 【評価方針】

到達目標について、工学研究科の成績評価の方針にしたがって評価する。

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

授業中に指示する

### [Study outside of class (preparation and review)]

未入力

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG44 6H651 LJ61					
<b>Course title (and course title in English)</b>	高分子生成論特論 Design of Polymerization Reactions, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOUCHI MAKOTO		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,3times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG44 6H652 LJ61			
<b>Course title (and course title in English)</b>	反応性高分子特論 Reactive Polymers, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Global Environmental Studies Professor, TANAKA KAZUO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
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Continue to 反応性高分子特論(2)					

反応性高分子特論(2)

[Study outside of class (preparation and review)]

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG44 6H653 LJ61					
<b>Course title (and course title in English)</b>	生体機能高分子特論 Biomacromolecular Science, Adv.			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AKIYOSHI KAZUNARI Graduate School of Engineering Associate Professor, YOSHIHIRO SASAKI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
, 5 times, , 3 times, , 3 times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG44 6H654 LJ61				
<b>Course title (and course title in English)</b>	高分子機能学特論 Polymer Structure and Function, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOKITA HIDEO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In this class, optoelectronic functions of polymeric materials are discussed on the basis of photochemistry and photophysics. In particular, the importance of designing nanostructures of polymer assembly is highlighted by explaining examples of state-of-the-art applications, which include optical fibers, organic light-emitting diode, and organic solar cells.					
<b>[Course objectives]</b>					
Students will gain an understanding of the importance of polymer materials and nano-assembled structures that support polymer functions. Students will also foster their abilities to consider advanced functional materials on the basis of fundamental knowledge of polymer chemistry and photochemistry.					
<b>[Course schedule and contents]</b>					
<p>Course overview (1 class) Explanation is made of fields in contemporary society in which polymeric functional materials are actively utilized. The overall orientation of this course is also explained.</p> <p>Conductive functions of polymers (3 classes) Detailed explanation is made of the basic electronic properties of polymers, including conductive polymers, polymer semiconductors, etc. Functions of such polymer materials are found in the organic electronics field, including photoconductive materials and thin-film transistors.</p> <p>Optoelectronic functions of polymers (4 classes) Explanation is made of the development of optical function polymers, electroexcitation dynamics, and basic processes of photochemistry, together with optical functions used in related applications. Fundamentals concerning the optical properties of polymer materials are discussed, as well as polymer-related developments in the optics field.</p> <p>Photovoltaic conversion functions of polymers (3 classes) The importance of electron transfer is explained using as an example energy conversion in photosynthesis systems. Also described are application developments in organic photovoltaics (OPV) and organic light-emitting diodes (OLED), etc., which convert light into electricity, and electricity into light.</p>					
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Continue to 高分子機能学特論(2)					

## 高分子機能学特論(2)

### **[Course requirements]**

As prerequisites for this course, students are to have completed courses in physical chemistry and polymer chemistry in the faculty of engineering chemistry.

### **[Evaluation methods and policy]**

#### **【Evaluation method】**

Evaluation will be based on reports (80%) and class performance (20%).

- Those who are absent more than half will not be credited.

#### **【Evaluation policy】**

Achievement of goals is evaluated according to the grade evaluation policy of the graduate.

### **[Textbooks]**

Copies of lecture notes will be distributed and used in classes.

### **[References, etc.]**

#### **( Reference books )**

None:

### **[Study outside of class (preparation and review)]**

Students are to review distributed copies of lecture materials and perform review study in relevant domains.

### **( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG44 6H655 LJ61				
<b>Course title (and course title in English)</b>	高分子溶液学特論 Polymer Solution Science, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAMURA YOU Graduate School of Engineering Associate Professor, IDA DAICHI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Effects of stiffness and local conformations of polymer chains on polymer solution properties observed in the light scattering and viscosity experiments are considered based on appropriate polymer chain models.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
<p>Review, 1time, Definitions of physical quantities determined from the light scattering and viscosity measurements and the theoretical formulations of those quantities.</p> <p>Experiments in dilute polymer solutions, 2times, Principles of the light scattering and viscosity experiments.</p> <p>Polymer chain models and their statistics, 2times, Static models for polymer chains: the Gaussian chain, the wormlike chain, and the helical wormlike chain. A comparison of experimental data for the mean-square radius of gyration with relevant theories.</p> <p>Excluded-volume effects, 2times, Intra- and intermolecular excluded-volume effects represented by the expansion factors and the second virial coefficient, respectively.</p> <p>Steady-state transport properties, 2times, A comparison of experimental data for the intrinsic viscosity and diffusion coefficient with relevant theories.</p> <p>Dynamic properties, 2times, Dynamic models for polymer chains: the Rouse-Zimm spring-bead model and the dynamic helical wormlike chain. A comparison of experimental data for the first cumulant of the dynamic structure factor with relevant theories.</p>					
<b>[Course requirements]</b>					
Basic knowledge of polymer solutions given in the lecture Polymer Physical Properties (10D651).					
<b>[Evaluation methods and policy]</b>					
Term-end examination.					
<b>[Textbooks]</b>					
Lecture note distributed in the class.					
<b>[References, etc.]</b>					
( Reference books )					
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Continue to 高分子溶液学特論(2)					

## 高分子溶液学特論(2)

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**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG44 6H656 LJ61				
<b>Course title (and course title in English)</b>	高分子基礎物理化学特論 Physical Chemistry of Polymers, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KOGA TSUYOSHI Graduate School of Engineering Associate Professor, NISHIDA KOUJI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Molecular mechanism of characteristic physical properties of polymeric systems is lectured on the basis of the equilibrium and non-equilibrium statistical mechanics. Main topics are phase separation of polymer solutions and mixtures, microphase separation of block copolymers, gelation, rubber elasticity, and rheology of physical gels.					
<b>[Course objectives]</b>					
Understanding the molecular mechanism of characteristic physical properties of polymeric systems based on the equilibrium and non-equilibrium statistical mechanics.					
<b>[Course schedule and contents]</b>					
phase separation of polymer solutions and mixtures, 2 times, phase diagram, Flory-Huggins theory, mean-field theory, phase separation, spinodal decomposition microphase separation of block copolymers, 1 time, microphase separation, density functional theory, directed self-assembly gelation, 1 time, definition of gels, classification of gels, classical theory of gels, sol-gel transition, elastically effective chains rubber elasticity, 3 times, affine network theory, phantom network theory, tetra-PEG gel, slide-ring gel rheology of associating polymers, 3 times, telechelic associating polymers, linear viscoelasticity, Maxwell model, shear thickening, transient network theory, colloid/polymer mixture, shear-induced gel verification of understanding, 1 time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) P.J. Flory, Principles of Polymer Chemistry (Cornell Univ. Press, New York, 1955) M. Rubinstein, R.H.					
Continue to 高分子基礎物理化学特論(2)					

## 高分子基礎物理化学特論(2)

Colby, Polymer Physics (Oxford Univ. Press, New York, 2003)

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG44 6H658 LJ61				
<b>Course title (and course title in English)</b>	高分子集合体構造特論 Polymer Supramolecular Structure, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TAKENAKA MIKIHITO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Polymers self-assemble or self-organize by intra- and/or intermolecular interaction to form assembled structures of polymer molecules. Such structures are closely related to the properties of the polymeric materials, it is necessary to control the assembled structures of the constituent polymer molecules in order to control the properties of polymeric materials, especially solid materials. In this lecture particularly, formation mechanisms, analytical techniques, and elucidated structures of crystalline polymers, phase-separated structures of polymer mixtures, microphase-separated structures of block and graft copolymers will be discussed.					
<b>[Course objectives]</b>					
This course aims for the development of the faculty to infer the properties of polymeric materials from their morphology based on the knowledge of structure-property relationships of higher-order structures of crystalline polymers, phase-separated structures of polymer mixtures (blends), microdomain structures of block copolymers, etc.					
<b>[Course schedule and contents]</b>					
Self-assembly and Self-organization, 1time, The differences between self-assembly and self-organization will be discussed by referring the examples in natural phenomena and polymeric systems. Crystalline Polymers, 3times, In the lectures, unit cell structures and hierarchical higher-order structures of polymer crystals such as folded-chain lamellar crystals and spherulites, as well as deformation and thermal behavior of polymer crystals will be discussed. Polymer Blends, 3times, Miscibility, phase-diagrams, mechanisms and dynamics of phase transitions, relationships between phase-separated structures and properties, methods to control the phase-separated structures will be discussed. Block and Graft Copolymers, 3times, The lectures include nano-scale domain formation of block copolymers by microphase-separation, miscibility and phase diagrams, order-disorder and order-order transitions, bicontinuous structures, structure formation in thin films, blends with homopolymers or other block copolymers, multi-component multi-block copolymers, miktoarm star block copolymers, and more. Evaluation of Degree of Understandings, 1time, Degree of understandings of the lectures will be evaluated by means of a short test and group discussions.					
<b>[Course requirements]</b>					
Thermodynamics preferable.					
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Continue to 高分子集合体構造特論(2)					

## 高分子集合体構造特論(2)

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### [Evaluation methods and policy]

The grading is based on the short tests and report assignments.

### [Textbooks]

Not used.

### [References, etc.]

#### ( Reference books )

Introduced in the lectures.

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG44 6H659 LJ61				
<b>Course title (and course title in English)</b>	高分子材料設計特論 Design of Polymer Materials, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Chemical Research Professor, TSUJII YOSHINOBU	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course aims at better understanding of fundamentals on living radical polymerization and describes its application to graft polymerization for novel surface modification as well as its related matters.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Introduction to radical polymerization, 1time, radical polymerization, mechanism, kinetics, elementary reaction Fundamentals on living radical polymerization and its application to material design, 2times, living radical polymerization, mechanism, kinetics, functional polymer, material design Physical chemistry on surfaces and polymer brushes, 2times, Surface, interface, physical chemistry, polymer brush, theory, structure, property Living radical polymerization and polymer particles, 2times, Living radical polymerization, surface-initiated polymerization, polymer brush, hairy particle, star polymer Synthesis of polymer particles by radical polymerizations, 2times, Emulsion polymerization, suspension polymerization, dispersion polymerization, precipitation polymerization, self-organized precipitation, nonspherical particle Applications of polymer particles, 2times, Self-assembly, dispersion and aggregation, depletion force, pickering emulsion, composites, biochemical and biomedical applications					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
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Continue to 高分子材料設計特論(2)					

## 高分子材料設計特論(2)

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**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG44 6H660 LJ61					
<b>Course title (and course title in English)</b>	高分子制御合成特論 Polymer Controlled Synthesis, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Chemical Research Professor, YAMAGO SHIGERU Institute for Chemical Research Associate Professor, TOSAKA MASATOSHI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,2times, ,2times, ,1time, ,1time, ,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG44 6H661 LJ61				
<b>Course title (and course title in English)</b>	医薬用高分子設計学特論 Polymer Design for Biomedical and Pharmaceutical Applications, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Life and Medical Sciences Professor, TABATA YASUHIKO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>外科および薬物治療、予防、診断など、現在の医療現場では、種々の生体吸収性および非吸収性の高分子材料が用いられている。本講では、これらの材料を設計する上で必要となる材料学的基礎と生物、薬学、医学的な基礎事項について講述する。さらに、高分子材料を用いたドラッグデリバリーシステム（DDS）あるいは再生医療への応用についても概説する。</p>					
<b>[Course objectives]</b>					
<p>バイオマテリアルとは何か、医薬用高分子設計学におけるバイオマテリアル技術の役割が理解できる。</p>					
<b>[Course schedule and contents]</b>					
<p>概論(1回) 現在の外科・内科治療で用いられている材料について、具体例を示しながら概説するとともに、授業全体の流れと扱う内容について説明する。人工血管、人工腎臓、人工肝臓、創傷被覆材、生体吸収性縫合糸などの実物を見ることによって、高分子材料が大きく医療に貢献していることを実感してもらう。</p> <p>生体吸収性および非吸収性材料(2回) 医療に用いられている生体吸収性および非吸収性高分子、ならびに金属やセラミックスなどの材料について説明する。</p> <p>医薬用高分子設計のための生物医学の基礎知識(2回) 医薬用高分子材料を設計する上で必要となる材料と生体との相互作用を理解するための最低限の基礎知識、すなわちタンパク質、細胞、組織などについて説明する。</p> <p>抗血栓性材料(1回) 血液がかたまらない性質（抗血栓性）をもつ材料を説明することによって、生体と材料との相互作用についての理解を深めるとともに、材料の研究手法と設計方法を学ぶ。</p> <p>生体適合性材料(1回) 細胞がなじむ（細胞親和性）や組織になじむ（組織適合性）をもつ材料を説明することによって、生体と材料との相互作用についての理解を深め、材料の研究手法と設計方法を学ぶ。</p> <p>ドラッグデリバリーシステム(DDS)のための生物薬学の基礎知識(1回) ドラッグデリバリーシステム(DDS)のための材料設計を行う上で必要となる最低限の医学、薬学知識について説明する。</p>					
<p style="text-align: right;">Continue to 医薬用高分子設計学特論(2)</p>					

## 医薬用高分子設計学特論(2)

### ドラッグデリバリーシステム(DDS)(2回)

薬の徐放化、薬の安定化、薬の吸収促進、および薬のターゲティングなどのDDSの具体例を示しながら、DDSのための材料の必要性を理解させ、材料の研究手法や設計方法を学ぶ。

### 再生医療(1回)

再生誘導治療（一般には再生医療と呼ばれる）の最前線について説明する。再生医療には細胞移植による生体組織の再生誘導と生体吸収性材料とDDSとを組み合わせることで生体組織の再生を誘導する（生体組織工学、Tissue Engineering）の2つがある。この2つの再生医療における材料学の重要な役割について説明する。

### [Course requirements]

None

### [Evaluation methods and policy]

医薬用高分子に関する講義内容の理解度の判定を目的に、成績評価は、出席状況と試験により行うことを基本とする。

### [Textbooks]

授業で配布する講義プリントを使用する。

### [References, etc.]

（ Reference books ）

### [Study outside of class (preparation and review)]

必要に応じて指示する

### （ Other information (office hours, etc.) ）

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG15 6H662 LJ61			
<b>Course title (and course title in English)</b>	先端機能高分子 Developments in Polymer Assembly and Functionality		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,MATSUOKA HIDEKI Graduate School of Engineering Senior Lecturer,LANDENBERGER, Kira Beth	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,2times, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
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Continue to 先端機能高分子(2)					

## 先端機能高分子(2)

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG15 6H663 LJ61					
<b>Course title (and course title in English)</b>	生命医科学 Life and Medical Sciences		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Life and Medical Sciences Professor,EIRAKU GENJI Institute for Life and Medical Sciences Associate Professor,OHGUSHI MASATOSHI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,3times, ,4times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG44 6H664 LJ61				
<b>Course title (and course title in English)</b>	先端機能高分子特論 Developments in Polymer Assembly and Functionality, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,MATSUOKA HIDEKI Graduate School of Engineering Senior Lecturer,LANDENBERGER, Kira Beth	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,2times, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
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Continue to 先端機能高分子特論(2)					

**先端機能高分子特論(2)**

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG44 6H665 LJ61					
<b>Course title (and course title in English)</b>	生命医科学特論 Life and Medical Sciences, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Life and Medical Sciences Professor,EIRAKU GENJI Institute for Life and Medical Sciences Associate Professor,OHGUSHI MASATOSHI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,3times, ,4times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG45 6P651 SB61 G-ENG15 6P651 SB61				
<b>Course title (and course title in English)</b>	高分子科学セミナーI Polymer Science Seminar I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KOGA TSUYOSHI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>		<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
高分子合成および高分子材料に関する最近の進歩や将来展望等について、セミナー形式で討論を行う。					
<b>[Course objectives]</b>					
高分子化学の最近の進歩を理解する。					
<b>[Course schedule and contents]</b>					
学外講師による高分子合成・材料に関するセミナー(4回) 高分子合成・材料に関する最近の進歩や将来展望等について、セミナー形式で討論を行う。					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
担当講師が課すレポート等の課題によって理解度を評価する。					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
必要に応じて指示する					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG15 6P652 SJ61 G-ENG45 6P652 SJ61					
<b>Course title (and course title in English)</b>	高分子科学セミナーII Polymer Science Seminar II			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KOGA TSUYOSHI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>		<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
高分子物性に関する最近の進歩や将来展望等について、高分子材料における構造特性と機能発現との関係に焦点をあてて、セミナー形式で討論を行う。						
<b>[Course objectives]</b>						
高分子化学の最近の進歩を理解する。						
<b>[Course schedule and contents]</b>						
学外講師による高分子物性に関するセミナー(4回) 高分子物性に関する最近の進歩や将来展望等について、セミナー形式で討論を行う。						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
担当講師が課すレポート等の課題によって理解度を評価する。						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
必要に応じて指示する						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG45 6S604 LJ61				
<b>Course title (and course title in English)</b>	高分子化学特別セミナー 1 Advanced Seminar on Polymer Chemistry 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KOGA TSUYOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG45 6S605 LJ61					
<b>Course title (and course title in English)</b>	高分子化学特別セミナー 2 Advanced Seminar on Polymer Chemistry 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KOGA TSUYOSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG16 7D828 EJ60					
<b>Course title (and course title in English)</b>	合成・生物化学特別実験及演習 Special Experiments and Exercises Synthetic Chemistry and Biological Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUDA KENJI		
<b>Target year</b>		<b>Number of credits</b>	8	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,30times, ,15times, ,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG16 5D840 LJ60					
<b>Course title (and course title in English)</b>	合成・生物化学特論 B Synthetic Chemistry and Biological Chemistry, Adv,B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUDA KENJI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG16 5D842 LJ60				
<b>Course title (and course title in English)</b>	合成・生物化学特論 D Synthetic Chemistry and Biological Chemistry, Adv,D		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUDA KENJI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,7.5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG16 5D844 LJ60					
<b>Course title (and course title in English)</b>	合成・生物化学特論 F Synthetic Chemistry and Biological Chemistry, Adv,F			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUDA KENJI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,7.5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG16 5H805 LJ60					
<b>Course title (and course title in English)</b>	機能性錯体化学 Functional Coordination Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Advanced Study Associate Professor,HORIKE SATOSHI Institute for Advanced Study Professor,FURUKAWA SHIYUUHEI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
The chemistry, physics and function of metal complexes and coordination polymers are explained. The lecture also introduces supramolecular complexes and metal organic frameworks (MOF) for energy-related materials and biological applications.						
<b>[Course objectives]</b>						
Understand the synthesis, structure, and physical properties and functions of metal complexes and coordination polymers.						
<b>[Course schedule and contents]</b>						
Fundamental coordination chemistry,2times,Structure and properties of metal complexes Chemistry of coordination polymers and metal organic framework (MOF),3times,Structure and function of coordination polymer and metal-organic framework (MOF) Coordination chemistry and solid state chemistry,3times,Relationship of coordination chemistry and solid state chemistry Supramolecular complexes and biological applications,3times,Design and application of supramolecular complexes related to bio-technology						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Evaluate in the report.						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
Lecture of every other year						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG46 5H806 LJ61 G-ENG16 5H806 LJ61				
<b>Course title (and course title in English)</b>	有機機能化学 Organic Functional Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OGOSHI TOMOKI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
機能性有機材料・分子集合体・超分子化学について概説する。また、最近の有機機能化学のトピックスについても解説する。					
<b>[Course objectives]</b>					
機能性有機材料・分子集合体・超分子化学に関する基礎的内容から最新の研究内容を学ぶことで、有機機能化学への理解を深める。					
<b>[Course schedule and contents]</b>					
<p>分子間相互作用（2回） 機能性有機材料を設計するための分子間相互作用について概説する。</p> <p>ホスト - ゲスト化学・分子集合体（5回） 分子間相互作用を基にしたホスト - ゲスト化学の基礎と分子集合体への展開について概説する。</p> <p>機能性有機材料（2回） ホスト - ゲスト化学、分子集合体を基にした機能性有機材料について最近のトピックスも合わせて概説する。</p> <p>機能有機化学演習（2回） 論文解説や講演会に関する質疑応答など。</p>					
<b>[Course requirements]</b>					
学部での有機化学、高分子化学の基礎知識があることが望ましいが、基礎からもう一度解説する。					
<b>[Evaluation methods and policy]</b>					
出席点およびレポートの採点、発表により総合的に評価する。					
<b>[Textbooks]</b>					
授業で配布する資料を使用する。					
<b>[References, etc.]</b>					
（ Reference books ）					
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Continue to 有機機能化学(2)					

有機機能化学(2)

**[Study outside of class (preparation and review)]**

講義資料による予習・復習を充分行うこと。

**( Other information (office hours, etc.) )**

隔年開講科目

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG16 6H812 LJ87				
<b>Course title (and course title in English)</b>	分子生物化学 Molecular Biology		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MORI YASUO Graduate School of Engineering Program-Specific Associate Professor,TAKAHASHI NOBUAKI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Biological responses are elicited at the interface of intrinsic genetic information and extrinsic environmental factors. This course discusses on molecular aspects of brain function and immunity. Experimental tools such as fluorescent probes for second messenger molecules are also explained through performance of experiments using the probes.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
Basics,1time, Principles of neurotransmission,3times, Immunity and inflammation,2times, Gaseous bioactive molecules,2times, Experiments to observe cellular responses,3times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
Provided in the course					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG16 6H813 LJ61			
<b>Course title (and course title in English)</b>	生物有機化学 Bioorganic Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, HAMACHI ITARU Graduate School of Engineering Senior Lecturer, TAMURA TOMONORI Graduate School of Engineering Senior Lecturer, KUBOTA RYOU	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In the course, we offer the lecture regarding the basic knowledge of chemical biology, a recently advanced research field between chemistry and biology, from the history originated from bioorganic chemistry, bioinorganic chemistry, molecular recognition (Host-guest) chemistry, supramolecular chemistry and natural product chemistry to the state-of-the art, by coupling the hot seminar from international guests.					
<b>[Course objectives]</b>					
<ul style="list-style-type: none"> <li>• To acquire the basic knowledge of the cutting-edge progress of chemical biology and new approaches when you need any ideas in your own interdisciplinary research projects in the future.</li> </ul>					
<b>[Course schedule and contents]</b>					
1 protein structure and function, 1 protein biosynthesis and chemical synthesis, 1 recent topics of protein modification and control, 1 bioorganic chemistry, 1 bioinorganic chemistry, 1 biomimetic chemistry, 1 molecular recognition/supramolecular chemistry, 1 natural product chemistry, 2 chemical biology 1 synthetic biology,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Evaluation will be based on active participation and assignments and an examination. Assignments and individual reports will be assessed on the basis of achievement level for course goals.					
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Continue to 生物有機化学(2)					



生物有機化学(2)

**[Textbooks]**

Not used

**[References, etc.]**

( **Reference books** )

Introduced during class

**[Study outside of class (preparation and review)]**

Nothing

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG16 6H834 LJ60					
<b>Course title (and course title in English)</b>	精密合成化学 Fine Synthetic Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor,ISHIDA NAOKI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
<p>principle and examples of selective reaction,4times,1. Hammond Postulate and Curtin-Hammett Principle 2. Chemo- and Stereoselectivities of Hydride Reduction 3. Cram Model and Felkin-Anh Model (Basic Rule) 4. Cram Model and Felkin-Anh Model (Application)</p> <p>total synthesis of natural products,6times,5. (+)-Himbacine (Chackalamannil 1999) (key point: Diels-Alder) 6. ZK-EPO (Schering AG 2006) (key point: Macrolactonization) 7. (-)-Dactylolide (McLeod 2006) (key point: Ireland-Claisen) 8. (-)-Scopadulcic Acid (Overman 1999) (key point: Heck Reaction) 9. (+)-Paniculatine (Sha 1999) (key point: Radical Cyclization) 10. Hirsutine (Tietze 1999) (key point: Domino Reaction)</p> <p>,1time,11. Confirmation of achievement degree: The synthesis of target molecules using selective reaction is proposed by students, and then, we discuss it.</p> <p>”</p>						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Paper test						
<b>[Textbooks]</b>						
nothing						
<b>[References, etc.]</b>						
<p>( <b>Reference books</b> )</p> <p>Organic Synthesis Workbook II (Wiley-VCH), Organic Synthesis Workbook III (Wiley-VCH)</p>						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG16 5H836 LJ29			
<b>Course title (and course title in English)</b>	先端生物化学 Advanced Biological Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,ATOMI HARUYUKI Graduate School of Engineering Professor,MORI YASUO Graduate School of Engineering Professor,HAMACHI ITARU	
				Part-time Lecturer,HARA YUUI Graduate School of Engineering Senior Lecturer,TAMURA TOMONORI Graduate School of Engineering Associate Professor,SATOU TAKAAKI Graduate School of Engineering Senior Lecturer,KUBOTA RYOU	
<b>Target year</b>		<b>Number of credits</b>	3	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2,Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,4times, ,4times, ,3times, ,4times, ,2times, ,2times, ,3times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
----- Continue to 先端生物化学(2)					

先端生物化学(2)

**[Textbooks]**

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG16 5P836 LJ29				
<b>Course title (and course title in English)</b>	先端生物化学続論 Advanced Biological Chemistry 2 Continued		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,ATOMI HARUYUKI Graduate School of Engineering Professor,MORI YASUO Graduate School of Engineering Professor,HAMACHI ITARU Graduate School of Engineering Senior Lecturer,TAMURA TOMONORI Graduate School of Engineering Associate Professor,SATOU TAKAAKI Graduate School of Engineering Senior Lecturer,KUBOTA RYOU	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,3times, ,2times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG46 7S807 SJ60					
<b>Course title (and course title in English)</b>	合成・生物化学特別セミナー 1 Special Seminar 1 in Synthetic Chemistry and Biological Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUDA KENJI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times, ”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG46 7S808 SJ60					
<b>Course title (and course title in English)</b>	合成・生物化学特別セミナー 2 Special Seminar 2 in Synthetic Chemistry and Biological Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUDA KENJI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG46 7S809 SJ60					
<b>Course title (and course title in English)</b>	合成・生物化学特別セミナー 3 Special Seminar 3 in Synthetic Chemistry and Biological Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUDA KENJI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG17 6H033 LJ76				
<b>Course title (and course title in English)</b>	化学工学特論第三 Special Topics in Chemical Engineering III		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, TANIGUCHI TAKASHI	
<b>Target year</b>	1st year students or above	<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
ソフトマター系における基礎的な現象，理論的背景，計算方法を講義する。					
<b>[Course objectives]</b>					
ソフトマター系で生じる相転移現象と流動現象についての理論とシミュレーション法を理解する。					
<b>[Course schedule and contents]</b>					
<p>"I. ソフトマターと関係する現象とシミュレーション手法の概観（1回）</p> <p>II. 高分子系の計算科学 --- 相分離現象に関連した内容を中心に---</p> <p>A. 平衡状態（2回）</p> <ol style="list-style-type: none"> <li>1. 相分離現象の例</li> <li>2. 秩序変数，自由エネルギー</li> <li>3. 相分離が起こるための熱力学的条件 <ol style="list-style-type: none"> <li>(a). 化学ポテンシャル, 浸透圧 (<math>\leq</math> 汎関数微分)</li> <li>(b). 自由エネルギーの形と化学ポテンシャル、浸透圧の幾何学的意味</li> <li>(c). 核生成、スピノーダル分解 モルフォロジー</li> </ol> </li> <li>4. 臨界点の条件 <math>\Rightarrow</math> (臨界温度、臨界組成の導出)</li> <li>5. 平衡状態での界面プロファイルと界面エネルギーの導出</li> <li>6. ラプラス則について (変分原理から)</li> </ol> <p>B. 相分離ダイナミクス (3回)</p> <ol style="list-style-type: none"> <li>1. 連続の方程式</li> <li>2. 熱力学力と共役な熱力学変数</li> <li>3. 非平衡状態での物質流(現象論)</li> <li>4. 熱揺動の効果 確率微分方程式(Langevin方程式)</li> <li>5. スピノーダル分解 (散乱関数) <ol style="list-style-type: none"> <li>フォッカープランク方程式</li> <li>線形安定性解析 非線形解析 Langer-Baron-Miller理論</li> </ol> </li> <li>6. ドロップレットの成長 <ol style="list-style-type: none"> <li>(a) Ostwald成長、</li> <li>(b) Lifshitz--Slosov--Wagner理論</li> <li>(c) Thomsonの関係式</li> </ol> </li> <li>7. 流体力学効果 <math>\Rightarrow</math> <ol style="list-style-type: none"> <li>(a) Navier-Stokes 方程式</li> <li>(b) レイノルズ数 <math>Re</math></li> <li>(c) Oseen Tensor</li> </ol> </li> </ol>					
Continue to 化学工学特論第三(2)					

## 化学工学特論第三(2)

- (d) 応力の計算式の導出  
8. ドメインの成長則、

### C. 高分子メソ構造予測に対するアドバンスドな計算方法 (2回)

1. 平衡状態予測に対する自己無動着場理論
2. 動的自己無動着場理論
3. 任意の分岐構造をもつ高分子に対する密度汎関数理論

### D. 高分子レオロジ (3回)

1. 非絡み合い高分子のモデル
  - (a) ダンベルモデル,
  - (b) Rouse モデル
2. 絡み合い高分子モデル
  - (a) Tube モデル
  - (b) Primitive Chain Network モデル
  - (c) Slip-Link モデル

## III. フィードバック

(さらに深めたい内容を提案してもらい, それについて議論する) (1回)

### [Course requirements]

学部で学ぶベクトル解析, 流体力学, 熱力学, 統計力学の知識を前提とする。

### [Evaluation methods and policy]

平常点, 提出課題, を総合して評価する。

### [Textbooks]

その他, 講義中に資料を配布する。

### [References, etc.]

#### ( Reference books )

土井正男, 小貫明 『高分子物理・相転移ダイナミク』 ( 岩波書店, 2018 ) ISBN:4007307288

M. Doi and S.F. Edwards 『The Theory of Polymer Dynamic』 ( Oxford University Press,1990 ) ISBN: 0198520336

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

隔年開講科目。

Continue to 化学工学特論第三(3)

### 化学工学特論第三(3)

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG17 9E038 LJ76				
<b>Course title (and course title in English)</b>	プロセス設計 Process Design		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SOTOWA KENICHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Students will learn fundamental skills of designing chemical processes which consist of various unit operations. A conceptual design exercise of a chemical process will be carried out using the knowledge of chemical engineering and process simulation system.					
<b>[Course objectives]</b>					
It is requested to understand the way of conceptual design, and to have the skill of designing chemical processes by applying the knowledge of chemical engineering and related field.					
<b>[Course schedule and contents]</b>					
<p>Concept of process design, 1 time, The assembly of the optimally designed unit operations does not result in the total optimum system. The concepts of the system boundary and the total optimal design are explained.</p> <p>Computer-aided process design, 1 time, In an actual process design, use of a process simulator is indispensable. The design technique using the sequential modular approach, which is mainly used in the process simulator, is explained.</p> <p>How to use process simulators, 2 times, How to use the process simulator which is widely used in the real process design is explained.</p> <p>Reality of process design, 6 times, Process design consists of successive steps such as the acquisition of market research and data, process synthesis, and an equipment design. For these steps, the problems which should be taken into consideration are made clear, and the techniques which can be used at each step are explained.</p> <p>Practice of a chemical process design, 1 time, The design exercise is executed by 2 to 3 students#039 group.</p> <p>Oral presentation, 4 times, The design result at each group is presented at the oral session where all the faculty members attend.</p>					
<b>[Course requirements]</b>					
The basic knowledge of chemical engineering such as the unit operation and reaction engineering are requested.					
<b>[Evaluation methods and policy]</b>					
The results are evaluated by the contents of the final report and the oral presentation.					
<div style="text-align: right;">Continue to プロセス設計(2)</div>					

## プロセス設計(2)

### [Textbooks]

Lecture materials are distributed in the class.

### [References, etc.]

#### ( Reference books )

Introduced during class

#### ( Related URLs )

(<http://www.cheme.kyoto-u.ac.jp/processdesign/>)

### [Study outside of class (preparation and review)]

The design exercise is executed by 2 to 3 students#039 group.

### ( Other information (office hours, etc.) )

Each group of students is supervised by the professors of the affiliation laboratory. The credit obtained in this course cannot be counted as the credit for graduation if the students have taken the same subject at the undergraduate course of chemical process engineering.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG17 8E041 PB76					
<b>Course title (and course title in English)</b>	研究インターンシップ（化工） Research Internship in Chemical Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SOTOWA KENICHIRO		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training		<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>						
専攻として企画・実施しているドイツ国でのインターンシップについて、滞在先および帰国後の報告会により成績を評定し、単位認定を行なう。なお、専攻で指定する他のインターンシップも含まれる。						
<b>[Course objectives]</b>						
1．外国企業・外国文化の中での自己実践 2．世界的企業の研究活動に関する経験・知見の蓄積 3．語学（英語）力の向上と異なる背景を持つ人とのコミュニケーション力の向上 これらの達成度は、英語で実施する研修報告会を通して、評価・判断する。						
<b>[Course schedule and contents]</b>						
国際インターンシップ（27回）成績優秀な日本人学生をドルトムント工科大学を管理拠点として、EU企業に派遣し、2か月間のインターンシップ研修を受けさせ、日本とは異なる国での企業倫理、ものづくりの在り方ならびにヨーロッパ文化を学ばせる。 成果報告（2回）日本ならびにドイツにおいてそれぞれ1回ずつ、あわせて2回の研修報告会を英語で実施する。 国際交流会（2回）日独双方の学生がインターンシップで経験し学んだことを互いに発表し合い、意見交換を行うセミナーを開催し、専門分野のみならず、それぞれの国の文化についての体得させる。						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
成果報告（英語による口頭発表および質疑）						
<b>[Textbooks]</b>						
Not fixed						
<b>[References, etc.]</b>						
（ Reference books ）						
<b>[Study outside of class (preparation and review)]</b>						
渡航の準備は各自で行う。						
<b>（ Other information (office hours, etc.) ）</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG17 7E045 EJ76					
<b>Course title (and course title in English)</b>	化学工学特別実験及演習 Research in Chemical EngineeringI		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KAWASE MOTOAKI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,5times, ,5times, ,10times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG17 7E047 EJ76					
<b>Course title (and course title in English)</b>	化学工学特別実験及演習 Research in Chemical EngineeringII		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KAWASE MOTOAKI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times, ,6times, ,10times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG17 7E049 EJ76					
<b>Course title (and course title in English)</b>	化学工学特別実験及演習 Research in Chemical EngineeringIII			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KAWASE MOTOAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,3times, ,6times, ,12times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG17 7E051 EJ76					
<b>Course title (and course title in English)</b>	化学工学特別実験及演習 Research in Chemical EngineeringIV			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KAWASE MOTOAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,3times, ,4times, ,12times, ,2times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG17 5H003 LE76					
<b>Course title (and course title in English)</b>	Advanced Topics in Transport Phenomena Advanced Topics in Transport Phenomena(English lecture)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on "Langevin Equation", "Hydrodynamic Interaction", and "Linear Response Theory" will also be given.						
<b>[Course objectives]</b>						
To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.						
<b>[Course schedule and contents]</b>						
- Polymeric Liquids / Rheology, 6times, Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured. - Stochastic Process / Langevin Equation, 3times, To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process. - Green Function / Hydrodynamic Interaction, 2times, To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation. Understanding Check, 1time,						
<b>[Course requirements]</b>						
Under graduate level basic knowledge on "Fluid Mechanics / Transport Phenomena" and basic mathematics including "Vector Analysis" are required.						
<b>[Evaluation methods and policy]</b>						
Answers to several questions and exercises, which will be given during the course, are used to judge.						
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Continue to Advanced Topics in Transport Phenomena(2)						

## Advanced Topics in Transport Phenomena(2)

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### [Textbooks]

Transport Phenomena 2nd Ed., Bird, Stewart, Lightfoot, (Wiley)

### [References, etc.]

#### ( Reference books )

Introduction to Polymer Physics, Doi, (Oxford) Theory of Simple Liquids 4th Ed., Hansen, McDonald, (Academic Press) Colloidal Dispersions, Russel, Saville, and Schowalter, (Cambridge)

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

This is an biennial course taught in Japanese (2019, 2021, 2023, ...) or in English (2018, 2020, 2022, ...).

Code:

10H002 Japanese

10H003 English (Present Syllabus)

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG17 5H005 LJ76				
<b>Course title (and course title in English)</b>	分離操作特論 Separation Process Engineering, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SANO NORIAKI Graduate School of Engineering Associate Professor,NAKAGAWA KYUYA	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The separation related with transport phenomena of heat and mass and particles will be lectured. Adsorption, drying, distillation will be explained. In addition, new separation methods will be explained.					
<b>[Course objectives]</b>					
This course will deepen the students' understanding on multiphase transport phenomena by lecturing separation operations, and the students will know how to develop effective separation methods. Also they will know recent developments of separation techniques in chemical engineering.					
<b>[Course schedule and contents]</b>					
Separation using electric field (2times): Purification of gas and water using electric discharges and particle separation using dielectrophoresis are explained.					
Distillation (3times) Distillation is used commonly in chemical industries. Here, advanced knowledge on distillation about multi-component distillation, equipment design using enthalpy-component diagram, extraction distillation, etc. will be explained.					
Other separation operations (1time): Other separation operations, for example liquid-liquid extraction, membrane separation, etc. will be lectured.					
Drying(3times):Drying is a typical operation utilizing phase transformation and simultaneous transport of heat and mass. Quantitative understanding of drying rate will be lectured based on drying mechanism, and the students will solve the practice problems to learn them. Under the situation that varieties of drying apparatuses have been developed to dry many kinds of target materials, the general drying operations, quality of products, and the drying apparatuses will be lectured.					
Adsorption (2times):Analysis using adsorption is used for structural analysis of porous materials, and it is important to evaluate adsorbents. Here, basic knowledge about these analysis will be explained. The pore characteristics of adsorbents and appropriate analytical methods are lectured, and the students will solve the practice problems to learn them.					
<b>[Course requirements]</b>					
Basic knowledge about transport phenomena and separation engineering should be required.					
Continue to 分離操作特論(2)					

## 分離操作特論(2)

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### [Evaluation methods and policy]

Reports submitted from students and exams will be evaluated.

### [Textbooks]

Gendai Kagaku Kogaku Hashimoto and Ogino, Sangyo Tosho; Kanso Gijustu Jitsumu Nyumon Tamon, Nikkan Kogyo Shinbun

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Homework will be announced in classes.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG17 5H008 LJ76				
<b>Course title (and course title in English)</b>	反応工学特論 Chemical Reaction Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAWASE MOTOAKI Graduate School of Engineering Associate Professor, NAKAGAWA HIROYUKI Graduate School of Engineering Senior Lecturer, ASHIDA RIYUUCHI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>The following contents are covered:</p> <ul style="list-style-type: none"> <li>- Kinetic analysis of gas-solid-catalyst reaction, gas-solid reaction, CVD reaction, and enzymatic reaction,</li> <li>- Operation and design of reactors for gas-solid-catalyst and gas-solid reactions, and</li> <li>- Industrial reactors including fixed bed, fluidized bed, moving bed, simulated moving bed, and stirred tank types.</li> </ul>					
<b>[Course objectives]</b>					
To understand kinetic analysis of chemical reactions utilized in the industry and procedure to design and operate industrial reactors.					
<b>[Course schedule and contents]</b>					
<p>Gas-solid-catalyst reaction (1) Overview, 1time, Commercial catalysts and industrial gas-solid-catalyst reactions are overviewed. Chemical reaction engineering fundamentals of the gas-solid-catalyst reaction is explained.</p> <p>Gas-solid-catalyst reaction (2) Generalized effectiveness factor and selectivity in complex reactions, 1time, The generalized effectiveness factor and the selectivity affected by mass transfer are explained.</p> <p>Gas-solid-catalyst reaction (3) Deactivation and regeneration of catalyst, 2times, Deactivation mechanisms of solid catalysts are overviewed. The deactivation and consequent change in selectivity are explained in terms of the decay function and specific activity.</p> <p>Gas-solid-catalyst reaction (4) Design and operation of industrial catalytic reactors, 1time, Industrial catalytic reactors including fixed-bed and fluidized-bed reactors are overviewed. Design and operation of these reactors including thermal stability are explained.</p> <p>Liquid-solid-catalyst reaction -- Simulated moving bed reactor, 1time, Concepts and theories of simulated moving bed is explained. Its application to catalytic reactions are reviewed.</p> <p>CVD reaction (1) Fundamentals, 1time, Thermal and plasma chemical vapor deposition reactions and processes are overviewed. Fundamentals from chemical reaction engineering view point are explained.</p> <p>CVD reaction (2) Kinetic analysis and modeling, 1time, Kinetic analysis of CVD is described from CRE viewpoint. Reaction models including elementary reaction model and overall reaction model are derived and applied to some examples.</p> <p>Gas-solid reaction (1) Kinetic analysis, 2times, Kinetic measurement and analysis of complicated gas-solid reactions, particularly coal pyrolysis, are explained with the first-order reaction model to the distributed activation energy model (DAEM).</p> <p>Gas-solid reaction (2) Kinetic analysis of gas-solid reaction, 1time, Concepts and derivation of the reaction models including the grain model and the random-pore model are explained. Application of the models to coal gasification is overviewed.</p>					
Continue to 反応工学特論(2)					

## 反応工学特論(2)

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### [Course requirements]

Needs knowledge of chemical reaction engineering including heterogeneous reactions.

### [Evaluation methods and policy]

Based on the result of examination at the end of term and the results of quizzes and reports imposed every week

### [Textbooks]

Handouts are distributed at class.

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

Review contents learned at undergraduate courses of chemical reaction engineering before attending classes.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG17 5H011 LJ76				
<b>Course title (and course title in English)</b>	プロセスシステム論 Advanced Process Systems Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SOTOWA KENICHIRO Graduate School of Engineering Assistant Professor, TONOMURA OSAMU	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In the design and operation of chemical processes, various types of optimization problems arise. In this course, the formulation procedure of these problems and their solution methods are explained.					
<b>[Course objectives]</b>					
The course goals are to obtain the ability of constructing the mathematical models, solving the optimization problems, and explaining the results of optimization.					
<b>[Course schedule and contents]</b>					
<p>Formulations as the optimization problems, 1time, For optimization problems which arise in the design and operational problems, formulations as the optimization problems are introduced.</p> <p>Unconstraint optimization, 2times, For unconstrained single and multivariable optimization problems, analytical and numerical optimization methods are explained. For the design problem of chemical plants, optimization procedure using numerical differentiation is also explained.</p> <p>Linear programming, 1time, The applications of linear programming in the chemical engineering are explained.</p> <p>Lagrangian multipliers, 1time, For the problems containing equality constraints, it is explained that the necessary conditions for an extremum can be obtained by Lagrangian multipliers.</p> <p>Nonlinear programming with constraints, 2times, The concepts of quadratic programming and successive linear programming are explained, and their applications to chemical engineering problems are introduced.</p> <p>Dynamic programming, 1time, The concept of dynamic programming is explained, and its applications to chemical engineering problems are introduced.</p> <p>Mixed integer programming, 2times, For process synthesis and scheduling problems, the mathematical formulations as mixed integer (non) linear programming problems are explained, and their solution procedures are illustrated.</p> <p>Meta-heuristics, 1time, The concepts of meta-heuristic methods such as simulated annealing and genetic algorithm are explained using the examples which appear in the chemical engineering problems.</p>					
<b>[Course requirements]</b>					
The basic knowledge of unit operations, calculus and linear algebra is requested.					
<b>[Evaluation methods and policy]</b>					
The degree of understandings is evaluated by the homework (30 %) and final examination (70 %).					
<b>[Textbooks]</b>					
The supplemental prints are distributed in the class.					
----- Continue to プロセスシステム論(2) -----					

## プロセスシステム論(2)

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### [References, etc.]

#### ( Reference books )

Optimization of Chemical Processes (McGraw-Hill) 最適化 ( 岩波講座情報科学19 , 岩波書店 ) これならわかる最適化数学 ( 共立出版 )

### [Study outside of class (preparation and review)]

General knowledge of chemical engineering is necessary.

### ( Other information (office hours, etc.) )

This course is not opened in the 2023 academic year.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG17 5H017 LJ76				
<b>Course title (and course title in English)</b>	微粒子工学特論 Fine Particle Technology, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUSAKA SHUJI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Lectures focus on particle system operation and measurement methods, chiefly regarding the behavior and mechanical (kinetic) analysis of gas-phase dispersed particles. Theoretical explanation is also made of the particle charging phenomenon, which has a major impact on the behavior of gas-phase dispersed particles. Also discussed are the control of electrical charge and related application technologies.					
<b>[Course objectives]</b>					
Students will gain an understanding of the concepts underpinning particle dynamic analysis methods and will also foster their skills in overall particle-system operation applications.					
<b>[Course schedule and contents]</b>					
<p>Various particle properties and different types of measurement methods (3) Explanation is made of the mathematical unified descript method for particle size distribution, properties related to the activity of functional fine particles, as well as methods for their measurement and analysis.</p> <p>Particle adhesion and mechanical (kinetic) analysis (3) Lectures cover measurement methods for particle adhesion strength and collision and deformation mechanical analysis methods. The discrete element method is also explained.</p> <p>Particle behavior in air flow (3) Using physical models and probability theory, explanation is made of temporal and spatial variation of deposition and re-entrainment of air-conveyed fine particles, which are important phenomena in actual processes. Also described are complex scattering phenomena that accompany collisions between particles.</p> <p>Particle charge and control (2) Explanation is made of concepts regarding particle charging mechanisms and of quantitative analysis methods for charging processes. This will lead to the development of analysis methods that consider charge distribution. New control methods for particle charging are also introduced.</p>					
<b>[Course requirements]</b>					
Students should have fundamental knowledge of undergraduate-level particle engineering.					
<div style="text-align: right;">Continue to 微粒子工学特論(2)</div>					

## 微粒子工学特論(2)

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### [Evaluation methods and policy]

Evaluation is performed based on test scores.

### [Textbooks]

Lecture notes will be used.

### [References, etc.]

#### ( Reference books )

K. Okuyama, H. Masuda and S. Morooka 『Biryuushi Kougaku: Fine particle technology』 ( Ohmsha )  
ISBN:4-7828-2609-5

### [Study outside of class (preparation and review)]

Students must prepare for classes, and review after classes.

### ( Other information (office hours, etc.) )

Please visit KULASIS to find out about office hours.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG17 5H020 LJ76				
<b>Course title (and course title in English)</b>	界面制御工学 Surface Control Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MIYAHARA MINORU	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Molecules in contact with solids often behave differently from the bulk state as a result of physicochemical interactions from the solid wall. In this lecture, we will give an overview of the historical development of molecules' behavior, especially in the interface region where solids are involved, followed by lectures on molecular simulation methods and their statistical thermodynamic basics based on the importance of molecular approaches. While doing so, students will experience molecular simulation in a simple system.					
<b>[Course objectives]</b>					
The goal is to learn about the behavior of molecules in the interface region experimentally while comparing classical thermodynamic understanding with microscopic aspects by molecular simulation.					
<b>[Course schedule and contents]</b>					
<p>Surface / interface features (1 session) Surface / interface instability implied by surface tension, overview of lecture</p> <p>Development of the theory of air-solid interface molecular phase (2 sessions) We will discuss the historical development and current understanding of the theory of adsorption phenomena on solid surfaces and the behavior of molecules in confined spaces.</p> <p>Outline of molecular dynamics method and simulation exercise in simple systems (3 sessions) After outlining the basics and applications of molecular dynamics methods, we will practice molecular dynamics simulation in the interface region using a simple system.</p> <p>Statistical thermodynamics as the basis of molecular simulation (2 sessions) As the basis of the Monte Carlo (MC) method, we will lecture on classical statistical thermodynamics and placement integrals.</p> <p>Outline of MC method and simulation exercise in simple system (3 sessions) We will lecture on the state transition probability in the Markov process and work on practice of the MC method, which is a stochastic molecular simulation, in order to obtain the molecular arrangement according to the state appearance probability in various ensembles. In the final round, proficiency will be evaluated.</p>					
Continue to 界面制御工学(2)					

## 界面制御工学(2)

### [Course requirements]

Thermodynamics, rudimentary statistical thermodynamics, rudimentary programming and data processing

### [Evaluation methods and policy]

[Evaluation method]

Report grade (80%) Normal score evaluation (20%)

The normal score evaluation includes participation status in the class and the degree of understanding of quizzes given during lectures. It is difficult to reach a passing score without submitting all reports.

[Evaluation policy]

Achievement targets are evaluated according to the grade evaluation policy of the Faculty of Engineering. Report assignments are flexible with a high degree of freedom, and those with unique ideas are given high marks.

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Akira Ueda "Molecular Simulation-From Classical Systems to Quantum Systems Techniques" (Shokabo), Yosuke Nagaoka "Iwanami Basic Physics Series 7" Statistical Mechanics "" (Iwanami Shoten), Morikazu Toda "Physics 30 Lecture Series" Thermal Phenomena "30 Lectures" (Asakura Shoten), Ryogo Kubo "New Edition: Statistical Mechanics" (Kyoritsu Publishing), B. Widom, Translated by Kenichiro Koga "Introduction to Statistical Mechanics in Chemical Systems" (Chemicals)

### [Study outside of class (preparation and review)]

Review each lecture thoroughly. In addition, since the code of molecular simulation requires only a brief explanation, it is necessary to decipher it by yourself and perform execution, data analysis, and report creation appropriately.

### ( Other information (office hours, etc.) )

Office hours are to to be set depending on students' requests.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG17 5H021 LJ76			
<b>Course title (and course title in English)</b>	化学材料プロセス工学 Engineering for Chemical Materials Processing		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,OOSHIMA MASAHIRO Graduate School of Engineering Associate Professor,NAGAMINE SHINSUKE Graduate School of Engineering Assistant Professor,HIKIMA YUUTA	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Focusing on transport phenomena (flow amp rheology, mass flux, heat flux) in polymer processing process, the key relationships among polymer properties, processing schemes, and processing machine are taught.					
<b>[Course objectives]</b>					
The objective of this course is to know how the polymers are different in terms of thermal, rheological and mechanical properties. The attendees learn what Tg, Tc, Tm, G#039 and G are, how those properties can be measured and how these obtained measurement data can be appreciated. Visual Observation movies relates those properties with the transport phenomena that occur in several polymer processing processes.					
<b>[Course schedule and contents]</b>					
Orientation amp Introduction of Polymer Processing, 1 times,The characteristics of polymers are reviewed by exercising the characterization of general polymers, like PE, PP, PLA, PC, PS, PVC in terms of appearance, thermal and mechanical properties.					
State of Thermoplastic Polymer,1time,The relationship among pressure-volume-temperature of thermoplastic polymer is described. The way of identifying the Tg, Tc is taught. Several equations of state are introduced.					
Thermal Properties of Thermoplastic Polymers,2times,Several important thermal properties of thermoplastic polymers, such as glass transition temp, Tg, crystallization temp, Tc, and melting temp, Tm are explained together with the measurement methods of those thermal properties. The latest measurement device, Flash DSC, is introduced with some of the interesting data of crystallization process.					
Rheological Properties of Thermoplastic Polymers ,2times,The basic of polymer rheology, viscosity and elasticity, is given. Several phenomena of non-Newtonian fluid are introduced. The fundamental constitutive equations, Maxwell and Voigt models, describing the viscoelasticity of the polymers are explained.					
Exercising on identification of polymer structures, such as the degree of entanglement, molecular weight, presence of long-chain branch from the rheological data, relationship between polymer rheology and polymer structure is explained.					
Basic Flows in Polymer Processing, 1 times,The basics of Polymer Processing are the series of Melt, Flow and Shape. Here the class focus on the Flow. The two types flow, i.e., drag and pressure flows are explained together with master equation. Without solving the mathematical equations, the skill of estimating the velocity profile is cultivated.					
Visual Observation of Flow Phenomena in Processing Machine, 1 times,Entertaining several visual observation movies showing the flow phenomena in real polymer processing machine like injection molding machine and extruder, The effects of thermal and rheological properties of polymer on those flow phenomena are clarified.					
Phase separation and Morphology Formation,2times,The basic of phase separation of polymer-polymer, polymer-solvent are taught.					
Phase Separation Phenomena in Polymer Processing, 1 times,Several polymer processing schemes exploiting					
----- Continue to 化学材料プロセス工学(2) -----					

## 化学材料プロセス工学(2)

a phase separation phenomenon are introduced. Synergistic design of the polymer properties, processing scheme and processing machine is stressed.

Check what we learn, 1 time. During the class, plenty of quiz are given to check the understanding.

### [Course requirements]

Basic of Transport Phenomena

### [Evaluation methods and policy]

40% midterm quiz, 60% exam at end

### [Textbooks]

Handout

### [References, etc.]

#### ( Reference books )

Agassant, J.F., Polymer Processing: Principles and Modeling

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG17 5H023 LJ76				
<b>Course title (and course title in English)</b>	環境システム工学 Environmental System Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, MAKI TAISUKE Graduate School of Engineering Assistant Professor, MURANAKA YOSUKE	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
First, we overview the concept of environmentally benign chemical processing based on the causal relation between energy and environmental issues. Then, we discuss various new technologies for energy production and environmentally harmonized processes from the viewpoint of chemical engineering.					
<b>[Course objectives]</b>					
To learn methodology for system-up of environmentally benign process based on energy and exergy. To consider perspective of biomass and hydrogen utilization. To understand several environmental evaluation methods.					
<b>[Course schedule and contents]</b>					
Concept of environmentally benign system based on exergy, 4 times, Basic of exergy and calculation of exergy for various conversion process. The exercise will be conducted to confirm the understanding of exergy.					
Biomass conversion, 3 times, Introduction of various conversion processes for biomass and wastes from the view point of kinetics.					
Environmental evaluation method (1), 2 times, Introduction of various environmental evaluation methods Calculation of LCA analysis					
Environmental evaluation method (2), 2 times, Calculation of E-factor and environmental efficiency for several chemical processes					
Confirmation of study achievement, 1 time, Feedback of evaluation results for reports and exercises.					
<b>[Course requirements]</b>					
Basic knowledge for chemical engineering thermodynamics is required.					
<b>[Evaluation methods and policy]</b>					
Coursework will be graded based on the reports and the exercise in class.					
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Continue to 環境システム工学(2)					

## 環境システム工学(2)

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### [Textbooks]

The textbook is not required. Materials will be supplied by instructors.

### [References, etc.]

#### ( Reference books )

Physical chemistry, Thermodynamics

### [Study outside of class (preparation and review)]

Preparation study is required to understand the exergy.

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG17 6H035 LJ76					
<b>Course title (and course title in English)</b>	化学工学特論第四 Special Topics in Chemical Engineering IV				<b>Instructor's name, job title, and department of affiliation</b>	Part-time Lecturer,HIRANO SHIGEKI	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester		
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture		<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>							
<b>[Course objectives]</b>							
<b>[Course schedule and contents]</b>							
,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time,							
<b>[Course requirements]</b>							
None							
<b>[Evaluation methods and policy]</b>							
<b>[Textbooks]</b>							
<b>[References, etc.]</b>							
( Reference books )							
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Continue to 化学工学特論第四(2)							

化学工学特論第四(2)

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[Study outside of class (preparation and review)]

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG17 6P043 LJ76				
<b>Course title (and course title in English)</b>	化学工学セミナー 1 Chemical Engineering Seminar I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SOTOWA KENICHIRO	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,4times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG17 6P044 LJ76					
<b>Course title (and course title in English)</b>	化学工学セミナー 2 Chemical Engineering Seminar II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SOTOWA KENICHIRO		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG17 6P045 LJ76				
<b>Course title (and course title in English)</b>	化学工学セミナー 3 Chemical Engineering Seminar III		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SOTOWA KENICHIRO	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,4times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG17 6P046 LJ76					
<b>Course title (and course title in English)</b>	化学工学セミナー 4 Chemical Engineering Seminar IV		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, SOTOWA KENICHIRO		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG47 6T004 LJ76					
<b>Course title (and course title in English)</b>	化学工学特別セミナー 1 Special Seminar in Chemical Engineering 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAWASE MOTOAKI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,1time, ,2times, ,1time, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG47 6T006 LJ76					
<b>Course title (and course title in English)</b>	化学工学特別セミナー 3 Special Seminar in Chemical Engineering 3			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, KAWASE MOTOAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,1time, ,1time, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG47 6T007 LJ76			
<b>Course title (and course title in English)</b>	化学工学特別セミナー 4 Special Seminar in Chemical Engineering 4		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUSAKA SHUJI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
In this course, students will learn powder layer characterization and bulk handling as solid manipulation in the field of chemical engineering.					
<b>[Course objectives]</b>					
To acquire the basics of characterization methods focusing on shear testing of powder layers and application methods for bulk handling.					
<b>[Course schedule and contents]</b>					
Bulk properties and shear testing (5) Powder storage (3) Powder transport (6) Achievement check (1)					
<b>[Course requirements]</b>					
General chemical engineering is at the level of a master's degree, and basic knowledge of particle technology is required.					
<b>[Evaluation methods and policy]</b>					
Assessments will be based on the assignments in each lecture and the final assignment.					
<b>[Textbooks]</b>					
Use the English materials distributed in advance.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Introduced during class					
<b>[Study outside of class (preparation and review)]</b>					
Students are expected to prepare for the lecture.					
( <b>Other information (office hours, etc.)</b> )					
Please check KULASIS for office hour details.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG47 6T008 LJ76				
<b>Course title (and course title in English)</b>	化学工学特別セミナー 5 Special Seminar in Chemical Engineering 5		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MIYAHARA MINORU Graduate School of Engineering Professor, SANO NORIAKI Graduate School of Engineering Professor, OOSHIMA MASAHIRO Graduate School of Engineering Professor, SOTOWA KENICHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The state of the arts in chemical engineering is given in a series of lectures of professors who are experts in a specific field.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,4times, Polymer Processing -How to make a fine cellular foam,4times,Introducing the processing schemes of polymeric porous materials, the importance of the literacy of chemical engineering for the polymer processing is discussed. ,4times, ,3times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Presence to the lecture and Report submission					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG50 6G047 LJ71			
<b>Course title (and course title in English)</b>	応用力学 Applied Dynamics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Professor,NAKABE KAZUYOSHI Graduate School of Engineering Professor,OOWADA TAKU Graduate School of Engineering Professor,MATSUNO FUMITOSHI Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Professor,INOUE YASUHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time,					
<b>[Course requirements]</b>					
None					
Continue to 応用力学(2)					

## 応用力学(2)

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### [Evaluation methods and policy]

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG50 6V037 EB71					
<b>Course title (and course title in English)</b>	応用力学特別実験及び演習第一 Advanced Experiment and Exercise in Applied Mechanics I			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,5times, ,5times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG50 6V037 EB71					
<b>Course title (and course title in English)</b>	応用力学特別実験及び演習第二 Advanced Experiment and Exercise in Applied Mechanics II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,5times, ,5times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG70 7W005 SJ71					
<b>Course title (and course title in English)</b>	応用力学特別演習 A Advanced Exercise in Applied Mechanics A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG70 7W007 SJ71					
<b>Course title (and course title in English)</b>	応用力学特別演習 B Advanced Exercise in Applied Mechanics B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG70 7W009 SJ71					
<b>Course title (and course title in English)</b>	応用力学特別演習 C Advanced Exercise in Applied Mechanics C		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUBARA ATSUSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG70 7W011 SJ71					
<b>Course title (and course title in English)</b>	応用力学特別演習 D Advanced Exercise in Applied Mechanics D		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUBARA ATSUSHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG70 7W013 SJ71					
<b>Course title (and course title in English)</b>	応用力学特別演習 E Advanced Exercise in Applied Mechanics E			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG70 7W015 SJ71					
<b>Course title (and course title in English)</b>	応用力学特別演習 F Advanced Exercise in Applied Mechanics F			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUBARA ATSUSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG70 6W017 EJ73			
<b>Course title (and course title in English)</b>	構造工学実験法 Strucutual Testing Technology		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,YAGI TOMOMI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
The structural design method is going to shift to the performance based design. Since applications of new construction methods and new technology can be accelerated by the use of performance based design, it is necessary to evaluate the performance of structures by the material and structural tests. In this class, the various test methods under static and dynamic loading will be discussed including shaking table test, wind tunnel test and nondestructive evaluation. Instrumentation to measure strain, force, acceleration, temperature and other physical state variables is also discussed through the course work.					
<b>[Course objectives]</b>					
To carry out the structural performance evaluation by material test and structural test based on fundamental understanding of measurement of strain, deflection and vibration in conjunction with the development of design methodology, computing technology, electronics and instrumentations.					
<b>[Course schedule and contents]</b>					
Physical Modeling in Structural Engineering(1) -Response and failure -Modeling process -Similitude requirements  Instrumentation(1) -Data acquisition of Strain, Stressm Displacement,Force, Acceleration, & Temperature -Data analysis -Nondestructive evaluation(Ultrasonic test, Magnetic particle test & Infrared test)  Loading System(1) -Loading apparatus -Hydraulic system -Computer control -Loading techniques  Loading Test for Buckling(1) Loading Test for Fatigue Cracking(1) Loading Test for Bolted Connections(1) Loading Test for Composite Structures(1)  Material Test(3) -Universal testing machine					
----- <b>Continue to 構造工学実験法(2)</b>					

## 構造工学実験法(2)

- Fatigue testing machine
- Stress vs. strain relation

### Structural Loading Testing(3)

- Static loading test
- Hybrid loading test
- Considerations in testing

### Shaking Table Test(1)

- Structural models for seismic loading
- Similitude requirements
- Considerations in shaking table test

### Wind Tunnel Test(1)

- Structural models for wind loading
- Similitude requirements
- Considerations in wind tunnel test

### Summary and Achievement Check

## [Course requirements]

Knowledge on construction materials, structural mechanics, structural dynamics, instrumentation engineering are required.

## [Evaluation methods and policy]

Grade is given based on attendance and reports.

## [Textbooks]

Textbook is provided.

## [References, etc.]

( Reference books )  
introduced if necessary

## [Study outside of class (preparation and review)]

none

## ( Other information (office hours, etc.) )

none

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG50 6W019 PJ71					
<b>Course title (and course title in English)</b>	インターンシップM (応用力学) Engineering Internship M		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor, KUROSE RYOUICHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<p>The aim of the internship is experiencing on-site activities involved production, manufacturing, development, designing and research of industrial goods at a factory or a research laboratory of Japanese leading companies.</p> <p>On-site learning of the importance of teamwork and production processes in manufacturing is also the aim.</p>						
<b>[Course objectives]</b>						
<p>The goal of the internship is to master a general method of thinking and methodology at Mechanical Engineering. Furthermore, by learning the relationship between a human and machines at an industry, motivate oneself to study and think about one's career development.</p>						
<b>[Course schedule and contents]</b>						
<p>As a general rule, the internship should meet the above purpose. The duration should be not less than two weeks. Thus, the following cases are not approved as an internship; a short internship such as a week, a company tour, a company explanation meeting and so on. Longer term more than two weeks and an overseas internship such as IAESTE can be acceptable.</p> <p>Internship location: Based on recruitment from companies. You can find them at company's web sites and/or the educational affairs office of the Engineering Science office (Butsuri Kyoumu).</p>						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Credits (2) are approved based on the summary report (50%) and presentation (50%) about the internship activities.						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
Consult with the internship host location.						
( Other information (office hours, etc.) )						
Pre-registration at the educational affairs office of the Engineering Science (Butsuri Kyoumu) is required.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG70 6W021 PJ71					
<b>Course title (and course title in English)</b>	インターンシップDS (応用力学) Engineering Internship DS		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor, KUROSE RYOUICHI		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
The purpose is to experience advanced studies related to mechanical engineering by the relatively long term research in domestic or foreign companies, universities and institutes, etc., and to learn the way of thinking and methodology.						
<b>[Course objectives]</b>						
The goal of the internship is to master a general method of thinking and methodology at Mechanical Engineering. Furthermore, motivate oneself to study and think about one's career development and to develop communication skill in group work and in international network.						
<b>[Course schedule and contents]</b>						
As a general rule, the internship should meet the above purpose. The duration should be not less than 12 weeks. Submission of a report and presentation in a report meeting after you finish the internship are required.						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Credits (4) are approved based on the summary report (50%) and presentation (50%) about the internship activities.						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
Consult with the internship host location.						
<b>( Other information (office hours, etc.) )</b>						
Pre-registration at the educational affairs office of the Engineering Science (Butsuri Kyoumu) is required.  *Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG70 6W023 PJ71					
<b>Course title (and course title in English)</b>	インターンシップDL (応用力学) Engineering Internship DL		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor, KUROSE RYOUICHI		
<b>Target year</b>		<b>Number of credits</b>	6	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
The purpose is to experience advanced studies related to mechanical engineering by the relatively long term research in domestic or foreign companies, universities and institutes, etc., and to learn the way of thinking and methodology.						
<b>[Course objectives]</b>						
The goal of the internship is to master a general method of thinking and methodology at Mechanical Engineering. Furthermore, motivate oneself to study and think about one's career development and to develop communication skill in group work and in international network.						
<b>[Course schedule and contents]</b>						
As a general rule, the internship should meet the above purpose. The duration should be not less than 24 weeks. Submission of a report and presentation in a report meeting after you finish the internship are required.						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Credits (6) are approved based on the summary report (50%) and presentation (50%) about the internship activities.						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
Consult with the internship host location.						
<b>( Other information (office hours, etc.) )</b>						
Pre-registration at the educational affairs office of the Engineering Science (Butsuri Kyoumu) is required.  *Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG70 6W025 SB71				
<b>Course title (and course title in English)</b>	応用力学セミナーA Seminar on Applied Mechanics A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUBARA ATSUSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,5times, ,5times, ,5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG70 6W027 SB71					
<b>Course title (and course title in English)</b>	応用力学セミナーB Seminar on Applied Mechanics B			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MATSUBARA ATSUSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,5times, ,5times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG72 5H403 LE61 G-ENG52 5H403 LE61			
<b>Course title (and course title in English)</b>	ディメンジョンの制御とナノ・マイクロ化学 Dimensional Control and Micro-Nano Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OTSUKA KOJI Graduate School of Engineering Professor, KAGEYAMA HIROSHI Graduate School of Engineering Professor, MATSUSAKA SHUJI Graduate School of Engineering Professor, ABE TAKESHI Graduate School of Engineering Professor, MIURA KIYOTAKA Institute for Chemical Research Professor, MURATA YASUJIROU Graduate School of Engineering Professor, SANO NORIAKI Graduate School of Engineering Professor, SOTOWA KENICHIRO Graduate School of Engineering Professor, NUMATA KEIJI Graduate School of Engineering Professor, KAWASE MOTOAKI Graduate School of Engineering Professor, OHKI YASUHIRO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Thu.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course focuses on the latest nano- and micro- technology on reaction mechanism, particle synthesis, structure control for solid catalyst, and reaction, separation, and analysis using nano- or micrometer sized devices.					
<b>[Course objectives]</b>					
The goals of this course are to understand reaction mechanism and material transfer mechanism in nanoscale and to obtain ability to apply to practical reaction systems.					
<b>[Course schedule and contents]</b>					
(1) Intercalation chemistry of graphite (Abe) (2) Solid formation from gas phase or liquid phase (Kawase) (3) New nanocarbon chemistry (Murata) (4) Controlled synthesis of nanotube materials (Sano) (5) Analytical separations in micro-nano fields (Otsuka) (6) Dimension and morphology control of molecular assemblies (Kimura)					
<div style="text-align: right;">Continue to ディメンジョンの制御とナノ・マイクロ化学(2)</div>					

ディメンジョンの制御とナノ・マイクロ化学(2)

(7) Femtosecond laser induced micro/nano structures and their applications (Miura)

(8) Molecular coordination compounds at the subnano-scale (Ohki)

(9) Control of particle motion in gases (Matsusaka)

(10) Dimensional control in magnetic materials (Kageyama)

(11) Multiphase flow in microchannels (Sotowa)

**[Course requirements]**

None

**[Evaluation methods and policy]**

Grades will be based on reports.

**[Textbooks]**

Handouts will be given in each lesson.

**[References, etc.]**

**( Reference books )**

Information will be given in each lesson.

**[Study outside of class (preparation and review)]**

Information will be given in each lesson.

**( Other information (office hours, etc.) )**

This course will be offered every two years; Not offered in 2017.

\*Please visit KULASIS to find out about office hours.

Course number		G-ENG52 5H404 LE61			
Course title (and course title in English)	分子機能と複合・集積機能 Molecular Function and Composite-Assembly Function		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor, IMAHORI HIROSHI Institute for Chemical Research Professor, KAJI HIRONORI Fukui Institute for Fundamental Chemistry Professor, SATOU TOORU Graduate School of Engineering Professor, AKIYOSHI KAZUNARI Graduate School of Engineering Professor, OOKITA HIDEO Graduate School of Engineering Professor, MATSUDA KENJI Institute for Chemical Research Professor, TSUJII YOSHINOBU Institute for Chemical Research Professor, NAKAMURA MASA HARU Graduate School of Engineering Professor, NAKAO YOSHI AKI Graduate School of Engineering Associate Professor, HIGASHI MASAHIRO Graduate School of Engineering Professor, NUMATA KEIJI Graduate School of Engineering Associate Professor, TANAKA TAKAYUKI	
Target year		Number of credits	1.5	Year/semesters	2023/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	English
<b>[Overview and purpose of the course]</b>					
Principles and their examples of revealing molecular function will be described based on molecular design. We also focus on guidelines of molecular design and their representative examples to achieve function of molecular composites and assemblies.					
<b>[Course objectives]</b>					
The goal of this course is to acquire abilities of proposing and performing research plans with regard to functions of molecular composites and assemblies by learning their principles and examples exhibiting molecular functions.					
<b>[Course schedule and contents]</b>					
Molecular function and composite-assembly function relating to light, 1 time. This lecture describes photosynthesis and artificial photosynthesis as examples of molecular function and composite-assembly function relating to light. Organic photonics and electronics including molecular photovoltaics are also highlighted as potential practical applications (Imahori).  Molecular function and composite-assembly function related with catalysis, 1 time. This lecture describes cooperative catalysis as examples of molecular function and composite-assembly function related with catalysis (Nakao).					
----- Continue to 分子機能と複合・集積機能(2) -----					



## 分子機能と複合・集積機能(2)

Biochemical functions and self-assembly of peptides, 1 time. This lecture introduces the biochemical functions and molecular/material designs of peptides via their self-assembly to understand the molecular design and synthesis of peptide materials (Numata).

Molecular function and composite-assembly function related with aromaticity, 1 time. This lecture describes the synthesis, structures, photophysical and magnetic properties of porphyrinoids as examples of molecular function and composite-assembly function related with aromaticity (Tanaka).

Molecular function and composite-assembly function of nanocarbon molecules, 1 time. This lecture describes the synthetic strategy, molecular function and composite-assembly function of novel nanocarbon molecules (Tanaka).

Biofunctional self-assembled nanomaterials and biomecical applications, 2 times. This lecture describes molecular chaperone functional engineering, nanogel tectonics engineering and proteoliposome engineering based on self-assembly of biomolecules and biopolymers. Biomedical applications such as drug delivery system (DDS) and tissue engineering are also highlighted (Akiyoshi).

Interfacial functions of polymer brushes and their novel device application, 2 times. This lecture aims at fundamental understandings of synthesis, structures, and chemical/physicochemical properties of polymer brushes and describes their novel application to e.g., tribology systems, solid electrolytes, and bio-interfaces (Tsuji).

Basics and recent developments of supramolecular photochemistry, 2 times. This lecture describes basics and recent developments of supramolecular photochemistry for the design and synthesis of photo-functional materials (Matsuda).

### [Course requirements]

Knowledge of an undergraduate level of chemistry as well as of English, especially listening and reading, is required.

### [Evaluation methods and policy]

The grading will be done on a basis of your participation and assignments.

### [Textbooks]

None

### [References, etc.]

#### ( Reference books )

None

#### ( Related URLs )

(None)

Continue to 分子機能と複合・集積機能(3)

## 分子機能と複合・集積機能(3)

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### [Study outside of class (preparation and review)]

After attending the class, attendees should read related references to deepen their knowledge and expertise on the topics. The references will be given in each class.

### ( Other information (office hours, etc.) )

This course was changed from every two years to every year in 2015. Prof. Imahori has been a head of this course since 2009.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG72 5H412 LJ61 G-ENG52 5H412 LJ61			
<b>Course title (and course title in English)</b>	先端二次電池 Advances in Rechargeable Batteries		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, ABE TAKESHI Graduate School of Engineering Associate Professor, MIYAZAKI KOUHEI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
二次電池は高効率エネルギー変換・貯蔵技術として低炭素社会の実現に必須の技術となりつつある。本講義では先端二次電池の起電反応と正極・負極・電解質材料の科学、反応のその場観察などについて、基礎的な解説を行うとともに、最先端のトピックスについても紹介する。					
<b>[Course objectives]</b>					
二次電池の概要を理解するとともに、二次電池の電極反応について学ぶ。					
<b>[Course schedule and contents]</b>					
<p>1. 二次電池概論（1回） 電池の歴史を概説し、これまでに実用化された蓄電池のうち、鉛蓄電池、ニッケルカドミウム電池、ニッケル水素電池について、その概要と電極反応を述べる。</p> <p>2. リチウムイオン電池正極材料（3回） リチウムイオン電池で実用化されている正極材料について概説し、その現状及び課題、さらには次世代正極について講義する。</p> <p>3. リチウムイオン電池負極材料（3回） リチウムイオン電池で実用化されている黒鉛負極、難黒鉛化性炭素負極について概説し、その電極反応について講義する。また、次世代負極についても述べる。</p> <p>4. リチウムイオン電池電解質材料（3回） リチウムイオン電池で実用化されている有機系電解質について概説し、その現状および課題について述べる。さらに、次世代電解質材料として期待されているポリマー電解質、無機固体電解質、イオン液体などについても述べる。</p> <p>5. リチウムイオン電池の反応機構（1回） リチウムイオン電池の長寿命化・高出入力化について反応機構の観点から概説する。</p>					
<b>[Course requirements]</b>					
工業化学科4回生担当の「電気化学」を履修しておくことが望ましい。					
Continue to 先端二次電池 (2)					

## 先端二次電池 (2)

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### [Evaluation methods and policy]

出席率と試験を総合して評価する。

### [Textbooks]

### [References, etc.]

( Reference books )

『リチウム二次電池』（オーム社）

### [Study outside of class (preparation and review)]

必要に応じて連絡する。

### ( Other information (office hours, etc.) )

隔年開講科目。

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG72 6H444 LE76 G-ENG52 6H444 LE76				
<b>Course title (and course title in English)</b>	Mathematics and Numerical Computing Mathematics and Numerical Computing		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,OOSHIMA MASAHIRO Graduate School of Engineering Professor,SOTOWA KENICHIRO	
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This class offers an introductory course of numerical computing with MATLAB, which is a world widely renowned scientific computing software. We want the students learn how to make a program code through several numerical calculation examples in chemistry and chemical engineering. At the last, the students are encouraged to use the MATLAB for solving the numerical problem that each students have in their thesis researches.					
<b>[Course objectives]</b>					
The aim of this course is to understand the MATLAB programming code and to make a own code for a simple numerical computing problems. Through exercising the programming, basic concept of several numerical computing scheme, such as Newton method, Euler, RKG, Finite Difference, etc., will be taught.					
<b>[Course schedule and contents]</b>					
<p>Introduction of Matlab,1time,Learn how to Get started. Learn the Basic Manipulation of matrix and vectors. Understanding of m-files and How to write if and for statements with Matlab.</p> <p>Solve Algebraic Equations,2times,Learn how to solve several Linear and Nonlinear Algebraic Equations. Some calculation methods, like Newton, Scant methods are reviewed. Equation of State, Flash Calculation, Hydrogen for Fuel Cell, Equilibrium Reaction are used for example problems for computing.</p> <p>Solve Ordinary Differential Equations,3times,Learn how to solve ordinary differential equations. Class starts withe single equation to multiple multi-variable differential equation. Euler and RKG methods are introduced as the typical numerical calculation schemes. Plug flow reactor, batch reactor design and simulations are considered as examples of numerical calculation.</p> <p>Introduce and Discuss own Numerical Computing Research Topics,1time,Students are requested to make a presentation on their research topics that can have any numerical computing issues. Discuss whether Matlab can be applicable for solving the issues.</p> <p>Data Analysis,2times,Learn how to deal with big experimental data and extract the information. Least square method and FFT are introduced. Near Infrared Spectral or Plant data will be provided to analyze with the Matlab coded by themselves.</p> <p>Solve Partial Differential Equations,2times,Learn how to solve a typical parabolic differential equation. Learn Finite difference (Explicit and Implicit schemes. Heat conduction and flow in tube are execized.</p>					
<b>[Course requirements]</b>					
None					
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Continue to Mathematics and Numerical Computing(2)					

## Mathematics and Numerical Computing(2)

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### [Evaluation methods and policy]

Attendance and Project Reports

### [Textbooks]

Handout from tutors

### [References, etc.]

( Reference books )

Informed accordingly

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

The class is not opened in 2019, and opened every other year.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG52 6H446 SE61					
<b>Course title (and course title in English)</b>	English for Debate and Communications English for Debate and Communications		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, OOSHIMA MASAHIRO		
<b>Target year</b>		<b>Number of credits</b>	1.5	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Fri.3,4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
The course is built up with 6 units. Through these six units one by one, the students can learn how to give, explain, organize their own opinion and conduct the debate.						
<b>[Course objectives]</b>						
Learn the basic and key phrases of active listening, interrupting, clarifying and confirming, paraphrasing, hesitating, and showing your understanding. After discussion and simulation of debating, debate is conducted for given questions.						
<b>[Course schedule and contents]</b>						
Unit 1: Giving Your Opinion, 2 times, Discussion Focus/ Key points Language Focus 1; Active Listening, Hesitating Practice Language Focus 2: Opinions/suggestion Putting them together. Discussion and Simulations. Debate Question of the Week 1 Unit 2: Explaining Your Opinion, 2 times, Discussion Focus/ Key points Topic Sentence, Primary Sentence, Debatable/No-debatable Practice Primary Supporting Sentence Practice Connecting Words and Practice Discussion and Simulation. Debate Question of the Week 2 Unit 3: Organizing Your Opinion, 2 times, Discussion Focus/ Key points Secondary Supporting Sentence Developing and Argument Practice Putting them together. Discussion and Simulations. Debate Question of the Week 3 Unit 4: Interrupting/Refuting Opinions, 2 times, Discussion Focus/ Key points Interrupting, Interrupting Practice Refuting Opinions, Refutation Practice Discussion and Simulations. Debate Question of the Week 4 Unit 5: Challenging Support, 2 times, Discussion Focus/ Key points Persuading Language, Making Proposals Practice Speaking Practice Challenging and Defending Language Discussion and Simulations. Debate Question of the Week 5 Unit 6: Delivery/Performance, 2 times, Discussion Focus/ Key points Persuasive Language Delivery Focus: Word/Sentence Stress. Intonation Discussion and Simulations. Debate Question of the Week 6						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Attendance and performance in the class						
<b>[Textbooks]</b>						
a in-house booklet be provided						
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Continue to English for Debate and Communications(2)						

English for Debate and Communications(2)

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**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>		G-ENG52 6H470 PE61			
<b>Course title (and course title in English)</b>	JGP国際インターンシップ (短期) JGP International Internship I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIAKI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
At the overseas cooperation university in Kyoto University Top Global Program, a research-based internship of one month is executed. Through the internship, study how to proceed the research at the advanced universities, and improve the English communication ability.					
<b>[Course objectives]</b>					
This course aims to understand the way of managing the research at the foreign university, and obtain the communication skills by which they can argue the details of research with foreign researchers.					
<b>[Course schedule and contents]</b>					
International Internship, 20 times, At the overseas cooperation university in Kyoto University Top Global Program, a research-based internship of one month is executed. Seminar, 1 time, The contents of the internship is reported at the seminar.					
<b>[Course requirements]</b>					
Careful plan of internship should be prepared under the supervision of Japanese supervisor. Enough English ability for discussing with the foreign supervisor during the internship is requested.					
<b>[Evaluation methods and policy]</b>					
The student in internship is requested to submit internship plan before the internship, some progress reports during the internship and the final report at the end of the internship. The seminar presentation is also requested after finishing the internship. The grading is conducted based on the period and the performance of the internship.					
<b>[Textbooks]</b>					
Not used None					
<b>[References, etc.]</b>					
( Reference books ) None					
<b>[Study outside of class (preparation and review)]</b>					
Prepare for travelling and living in addition to studying.					
<b>( Other information (office hours, etc.) )</b>					
By the limitation of budget for each year, the number of students will be restricted.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG52 6H471 PE61					
<b>Course title (and course title in English)</b>	JGP国際インターンシップ (中期) JGP International Internship II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIAKI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
At the overseas cooperation university in Kyoto University Top Global Program, a research-based internship of two month is executed. Through the internship, study how to proceed the research at the advanced universities, and improve the English communication ability.						
<b>[Course objectives]</b>						
This course aims to understand the way of managing the research at the foreign university, and obtain the communication skills by which they can argue the details of research with foreign researchers.						
<b>[Course schedule and contents]</b>						
International internship ,40times,At the overseas cooperation university in Kyoto University Top Global Program, a research-based internship of two month is executed. Seminar,1time,The contents of the internship is reported at the seminar.						
<b>[Course requirements]</b>						
Careful plan of internship should be prepared under the supervision of Japanese supervisor. Enough English ability for discussing with the foreign supervisor during the internship is requested.						
<b>[Evaluation methods and policy]</b>						
The student in internship is requested to submit internship plan before the internship, some progress reports during the internship and the final report at the end of the internship. The seminar presentation is also requested after finishing the internship. The grading is conducted based on the period and the performance of the internship.						
<b>[Textbooks]</b>						
None						
<b>[References, etc.]</b>						
( Reference books ) None						
<b>[Study outside of class (preparation and review)]</b>						
Prepare for travelling and living in addition to studying.						
<b>( Other information (office hours, etc.) )</b>						
By the limitation of budget for each year, the number of students will be restricted.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG52 6H472 PE61					
<b>Course title (and course title in English)</b>	JGP国際インターンシップ (長期) JGP International Internship III		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIAKI		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
At the overseas cooperation university in Kyoto University Top Global Program, a research-based internship of more than three month is executed. Through the internship, cultivate the abilities of communication with foreign researchers, management of a research, and writing research papers.						
<b>[Course objectives]</b>						
This course aims to acquire the skills of communicating with foreign researchers, managing the research, and writing academic papers.						
<b>[Course schedule and contents]</b>						
Theme Class number of times Description International internship, 60 times, At the overseas cooperation university in Kyoto University Top Global Program, a research-based internship of more than three month is executed. Seminar, 1 time, The contents of the internship is reported at the seminar.						
<b>[Course requirements]</b>						
Careful plan of internship should be prepared under the supervision of Japanese supervisor. Enough English ability for discussing with the foreign supervisor during the internship is requested.						
<b>[Evaluation methods and policy]</b>						
The student in internship is requested to submit internship plan before the internship, some progress reports during the internship and the final report at the end of the internship. The seminar presentation is also requested after finishing the internship. The grading is conducted based on the period and the performance of the internship.						
<b>[Textbooks]</b>						
None						
<b>[References, etc.]</b>						
( Reference books ) None						
<b>[Study outside of class (preparation and review)]</b>						
Prepare for travelling and living in addition to studying.						
<b>( Other information (office hours, etc.) )</b>						
By the limitation of budget for each year, the number of students will be restricted.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG14 6P448 LE60			
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.					
<b>[Course objectives]</b>					
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.					
<b>[Course requirements]</b>					
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.					
<b>[Evaluation methods and policy]</b>					
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.					
<b>[Textbooks]</b>					
A copy of related contents is offered.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Announced in the lecture.					
<b>[Study outside of class (preparation and review)]</b>					
Read through the documents if they are given before the lectures.					
( <b>Other information (office hours, etc.)</b> )					
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG14 6P450 LE60					
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.						
<b>[Course objectives]</b>						
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.						
<b>[Course schedule and contents]</b>						
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.						
<b>[Course requirements]</b>						
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.						
<b>[Evaluation methods and policy]</b>						
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.						
<b>[Textbooks]</b>						
A copy of related contents is offered.						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Announced in the lecture.						
<b>[Study outside of class (preparation and review)]</b>						
Read through the documents if they are given before the lectures.						
( <b>Other information (office hours, etc.)</b> )						
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 6P452 LE60					
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar III		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIAKI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.						
<b>[Course objectives]</b>						
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.						
<b>[Course schedule and contents]</b>						
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.						
<b>[Course requirements]</b>						
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.						
<b>[Evaluation methods and policy]</b>						
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.						
<b>[Textbooks]</b>						
A copy of related contents is offered.						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Announced in the lecture.						
<b>[Study outside of class (preparation and review)]</b>						
Read through the documents if they are given before the lectures.						
( <b>Other information (office hours, etc.)</b> )						
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG14 6P454 LE60			
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar IV		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.					
<b>[Course objectives]</b>					
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.					
<b>[Course requirements]</b>					
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.					
<b>[Evaluation methods and policy]</b>					
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.					
<b>[Textbooks]</b>					
A copy of related contents is offered.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Announced in the lecture.					
<b>[Study outside of class (preparation and review)]</b>					
Read through the documents if they are given before the lectures.					
( <b>Other information (office hours, etc.)</b> )					
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG14 6P456 LE60					
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar V		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.						
<b>[Course objectives]</b>						
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.						
<b>[Course schedule and contents]</b>						
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.						
<b>[Course requirements]</b>						
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.						
<b>[Evaluation methods and policy]</b>						
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.						
<b>[Textbooks]</b>						
A copy of related contents is offered.						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Announced in the lecture.						
<b>[Study outside of class (preparation and review)]</b>						
Read through the documents if they are given before the lectures.						
( <b>Other information (office hours, etc.)</b> )						
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG14 6P457 LE60					
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar VI		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.						
<b>[Course objectives]</b>						
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.						
<b>[Course schedule and contents]</b>						
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.						
<b>[Course requirements]</b>						
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.						
<b>[Evaluation methods and policy]</b>						
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.						
<b>[Textbooks]</b>						
A copy of related contents is offered.						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Announced in the lecture.						
<b>[Study outside of class (preparation and review)]</b>						
Read through the documents if they are given before the lectures.						
( <b>Other information (office hours, etc.)</b> )						
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG14 6P459 LE60			
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar VII		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.					
<b>[Course objectives]</b>					
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.					
<b>[Course requirements]</b>					
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.					
<b>[Evaluation methods and policy]</b>					
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.					
<b>[Textbooks]</b>					
A copy of related contents is offered.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Announced in the lecture.					
<b>[Study outside of class (preparation and review)]</b>					
Read through the documents if they are given before the lectures.					
( <b>Other information (office hours, etc.)</b> )					
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG14 6P461 LE60			
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar VIII		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIAKI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.					
<b>[Course objectives]</b>					
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.					
<b>[Course requirements]</b>					
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.					
<b>[Evaluation methods and policy]</b>					
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.					
<b>[Textbooks]</b>					
A copy of related contents is offered.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Announced in the lecture.					
<b>[Study outside of class (preparation and review)]</b>					
Read through the documents if they are given before the lectures.					
( <b>Other information (office hours, etc.)</b> )					
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG14 6P463 LE60			
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar IX		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.					
<b>[Course objectives]</b>					
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.					
<b>[Course requirements]</b>					
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.					
<b>[Evaluation methods and policy]</b>					
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.					
<b>[Textbooks]</b>					
A copy of related contents is offered.					
<b>[References, etc.]</b>					
( Reference books ) Announced in the lecture.					
<b>[Study outside of class (preparation and review)]</b>					
Read through the documents if they are given before the lectures.					
( Other information (office hours, etc.) )					
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG14 6P465 LE60					
<b>Course title (and course title in English)</b>	JGPセミナー Japan Gateway Project Seminar X		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIAKI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.						
<b>[Course objectives]</b>						
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.						
<b>[Course schedule and contents]</b>						
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.						
<b>[Course requirements]</b>						
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.						
<b>[Evaluation methods and policy]</b>						
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.						
<b>[Textbooks]</b>						
A copy of related contents is offered.						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Announced in the lecture.						
<b>[Study outside of class (preparation and review)]</b>						
Read through the documents if they are given before the lectures.						
( <b>Other information (office hours, etc.)</b> )						
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG14 6P467 LE60			
<b>Course title (and course title in English)</b>	JGPセミナー I Japan Gateway Project Seminar XI		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.					
<b>[Course objectives]</b>					
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.					
<b>[Course schedule and contents]</b>					
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.					
<b>[Course requirements]</b>					
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.					
<b>[Evaluation methods and policy]</b>					
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.					
<b>[Textbooks]</b>					
A copy of related contents is offered.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Announced in the lecture.					
<b>[Study outside of class (preparation and review)]</b>					
Read through the documents if they are given before the lectures.					
( <b>Other information (office hours, etc.)</b> )					
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG14 6P469 LE60					
<b>Course title (and course title in English)</b>	JGPセミナー II Japan Gateway Project Seminar XII		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, NAKAO YOSHIKI		
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.						
<b>[Course objectives]</b>						
Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.						
<b>[Course schedule and contents]</b>						
Introduction, 1time, The contents of a series of seminar are explained. Intensive lectures of the specific theme, 2times, For a given theme, a series of lectures is executed. Summary, 1time, The contents of a series of seminar are summarized, and the exercise for evaluating the level of understanding is executed.						
<b>[Course requirements]</b>						
The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.						
<b>[Evaluation methods and policy]</b>						
Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.						
<b>[Textbooks]</b>						
A copy of related contents is offered.						
<b>[References, etc.]</b>						
( <b>Reference books</b> ) Announced in the lecture.						
<b>[Study outside of class (preparation and review)]</b>						
Read through the documents if they are given before the lectures.						
( <b>Other information (office hours, etc.)</b> )						
Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG14 6P470 LE60				
<b>Course title (and course title in English)</b>	JGP計算実習(CFD) Japan Gateway Project Computation Exercise(CFD)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,SOTOWA KENICHIRO Graduate School of Engineering Assistant Professor,TONOMURA OSAMU	
<b>Target year</b>		<b>Number of credits</b>	0.5	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Computational fluid dynamics (CFD) is utilized in various fields such as shape design and analysis of flow conditions inside devices. In this lecture and exercise, we will explain the fundamentals of CFD for microchemical devices, conduct exercises using CFD software, and acquire the current state of CFD simulation technology.					
<b>[Course objectives]</b>					
Students can build models for devices with various channel shapes and acquire skills that can simulate the flow conditions in two and three dimensional devices without reaction. Also, for systems with heat transfer and/or reaction, students will acquire skills that can model them on their own by referring to the manual.					
<b>[Course schedule and contents]</b>					
1. Lecture and exercise (1): Fundamentals of CFD and its application to device design  2. Lecture and exercise (1): Basics of operation of CFD software  3. Lecture and exercise (1): Tutorial Exercise 1: Analysis of mixing characteristics in microdevices (2D)  4. Lecture and exercise (1): Tutorial Exercise 1: Analysis of mixing characteristics in microdevices (3D)					
<b>[Course requirements]</b>					
It is desirable to have basic knowledge on modeling related to material balance.					
<b>[Evaluation methods and policy]</b>					
Evaluation is based on the task in the lecture and the report.					
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Continue to JGP計算実習(CFD)(2)					



## JGP計算実習(CFD)(2)

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### [Textbooks]

Materials created by faculty are distributed to students.

### [References, etc.]

#### ( Reference books )

It will be introduced during the lecture.

### [Study outside of class (preparation and review)]

We plan to rent a computer or a software for a certain period of time. Students can pursue analysis and design tasks using the computer or the software. This allows students to review CFD simulation techniques.

### ( Other information (office hours, etc.) )

We may restrict the number of students taking into consideration the restrictions on available PCs and software and the effect of exercises.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG52 6W432 EB61				
<b>Course title (and course title in English)</b>	物質機能・変換科学特別実験及演習 Laboratory and Exercise on Materials Engineering and Chemistry I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG52 6W433 EB61					
<b>Course title (and course title in English)</b>	物質機能・変換科学特別実験及演習 Laboratory and Exercise on Materials Engineering and Chemistry II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG52 6W434 EB61					
<b>Course title (and course title in English)</b>	物質機能・変換科学特別実験及演習 Laboratory and Exercise on Materials Engineering and Chemistry III			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG52 6W435 EB61					
<b>Course title (and course title in English)</b>	物質機能・変換科学特別実験及演習 Laboratory and Exercise on Materials Engineering and Chemistry IV		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG72 6W437 SB61				
<b>Course title (and course title in English)</b>	物質機能・変換科学特別セミナー Advanced Seminar on Materials Engineering and Chemistry I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,8times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG72 6W438 SB61				
<b>Course title (and course title in English)</b>	物質機能・変換科学特別セミナー Advanced Seminar on Materials Engineering and Chemistry II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,8times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG72 6W439 SB61					
<b>Course title (and course title in English)</b>	物質機能・変換科学特別セミナー Advanced Seminar on Materials Engineering and Chemistry III			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,8times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG72 6W440 SB61					
<b>Course title (and course title in English)</b>	物質機能・変換科学特別セミナー Advanced Seminar on Materials Engineering and Chemistry IV		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI		
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,8times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG72 6W441 SB61					
<b>Course title (and course title in English)</b>	物質機能・変換科学特別セミナー Advanced Seminar on Materials Engineering and Chemistry V			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,8times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG72 6W442 SB61					
<b>Course title (and course title in English)</b>	物質機能・変換科学特別セミナー Advanced Seminar on Materials Engineering and Chemistry VI			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YAMAMOTO RYOICHI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,8times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG53 3W606 LJ88				
<b>Course title (and course title in English)</b>	画像診断学 Diagnostic Imaging		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Medicine Professor, NAKAMOTO YUUII	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,1time, ,6times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
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Continue to 画像診断学(2)					

## 画像診断学(2)

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG53 2B05a LJ87 G-ENG53 2W641 LB87					
<b>Course title (and course title in English)</b>	生理学 Physiology			<b>Instructor's name, job title, and department of affiliation</b>		Graduate School of Medicine Professor, WATANABE DAI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester		
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese		
<b>[Overview and purpose of the course]</b>							
<b>[Course objectives]</b>							
<b>[Course schedule and contents]</b>							
,1time, ,3times, ,2times, ,2times, ,2times, ,4times, ,1time, ” ” ” ” ” ” ” ” ”							
<b>[Course requirements]</b>							
None							
<b>[Evaluation methods and policy]</b>							
<div style="text-align: right;">Continue to 生理学(2)</div>							

生理学(2)

[Textbooks]

[References, etc.]

( Reference books )

[Study outside of class (preparation and review)]

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG53 5M423 LJ89   G-ENG53 6W652 LJ89   G-ENG53 5M423 LJ25 G-ENG53 5M423 LJ88			
<b>Course title (and course title in English)</b>	医学物理学 Medical Physics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Medicine Associate Professor, NAKAMURA MITSUHIRO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
” ”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG53 5W670 LJ25				
<b>Course title (and course title in English)</b>	生命医工分野セミナー A (修士 ) Seminar on Bio-Medical Engineering A (MC)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG53 5W671 LJ87					
<b>Course title (and course title in English)</b>	生命医工分野セミナー B (修士 ) Seminar on Bio-Medical Engineering B (MC)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI		
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG53 6W681 EB25				
<b>Course title (and course title in English)</b>	生命・医工分野特別実験および演習第一 Experiments and Exercises on Bio-Medical Engineering, Adv. I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG53 6W683 EB25				
<b>Course title (and course title in English)</b>	生命・医工分野特別実験および演習第二 Experiments and Exercises on Bio-Medical Engineering, Adv. II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG53 5W685 LJ25				
<b>Course title (and course title in English)</b>	生命・医工分野特別セミナーA Seminar on Bio-Medical Engineering A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG73 6W687 LJ87					
<b>Course title (and course title in English)</b>	生命・医工分野特別セミナーB Seminar on Bio-Medical Engineering B			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG73 6W689 LJ88				
<b>Course title (and course title in English)</b>	生命・医工分野特別セミナーC Seminar on Bio-Medical Engineering C		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG73 6W690 LJ89					
<b>Course title (and course title in English)</b>	生命・医工分野特別セミナーD Seminar on Bio-Medical Engineering D			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
”						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>	G-ENG53 5W691 PJ25				
<b>Course title (and course title in English)</b>	インターンシップM (生命・医工) Bio-Medical Engineering Internship M		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG73 5W692 PJ87				
<b>Course title (and course title in English)</b>	インターンシップD (生命・医工) Bio-Medical Engineering Internship D		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, YOKOKAWA RYUUI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG10 5X001 LJ72 G-ENG11 5X001 LJ72			
<b>Course title (and course title in English)</b>	融合光・電子科学の展望 Prospects of Interdisciplinary Photonics and Electronics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering Professor, WADA OSAMI Graduate School of Engineering Professor, KAWAKAMI YOUICHI Graduate School of Engineering Professor, KIMOTO TSUNENOBU Graduate School of Engineering Professor, NODA SUSUMU Graduate School of Informatics Professor, Oki Eiji	
				Part-time Lecturer, OHSIMA TAKESHI Graduate School of Engineering Professor, MATSUO TETSUJI Graduate School of Engineering Professor, SHIRAISHI MASASHI Yukawa Institute for Theoretical Physics Professor, SATO MASATOSHI Graduate School of Science Associate Professor, TAKASU YOUSUKE Graduate School of Science Associate Professor, TAKANISHI YOUICHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
-----					
Continue to 融合光・電子科学の展望(2)					

## 融合光・電子科学の展望(2)

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### [Evaluation methods and policy]

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG54 6X003 EB72				
<b>Course title (and course title in English)</b>	融合光・電子科学特別実験及演習 1 Advanced Experiments and Exercises in Interdisciplinary Photonics and Electronics I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG54 6X005 EB72					
<b>Course title (and course title in English)</b>	融合光・電子科学特別実験及演習 2 Advanced Experiments and Exercises in Interdisciplinary Photonics and Electronics II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,30times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG74 6X007 LJ72				
<b>Course title (and course title in English)</b>	融合光・電子科学特別セミナー Advanced Seminar on Interdisciplinary Photonics and Electronics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG54 6X009 SE72				
<b>Course title (and course title in English)</b>	融合光・電子科学通論 Recent Advances in Interdisciplinary Photonics and Electronics		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Senior Lecturer, KANEKO KENTAROU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.5	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,6times, ,9times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG54 6X015 PJ72				
<b>Course title (and course title in English)</b>	融合光・電子科学特別研修1(インターン) Advanced Seminar in Interdisciplinary Photonics and Electronics I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3,4,Fri.3,4	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,6times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG54 6X017 PJ72				
<b>Course title (and course title in English)</b>	融合光・電子科学特別研修2(インターン) Advanced Seminar in Interdisciplinary Photonics and Electronics II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3,4,Fri.3,4	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,6times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG54 6X019 PJ72				
<b>Course title (and course title in English)</b>	研究インターンシップM(融合光) Research Internship (M)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG74 6X019 PJ72				
<b>Course title (and course title in English)</b>	研究インターンシップD(融合光) Research Internship (D)		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese and English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
”					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG74 6X023 SJ72				
<b>Course title (and course title in English)</b>	融合光・電子科学特別演習1 Advanced Exercises on Interdisciplinary Photonics and Electronics I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG74 6X025 SJ72				
<b>Course title (and course title in English)</b>	融合光・電子科学特別演習2 Advanced Exercises on Interdisciplinary Photonics and Electronics II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG55 5X301 LE73				
<b>Course title (and course title in English)</b>	人間安全保障工学概論 Human Security Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.5	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>This lecture aims to get student to comprehensively and deeply understand issues related to Human Security Engineering as a system of technologies for designing and managing cities that enable inhabitants to live under better public health conditions, and environemntal destruction, as listed in the Millennium Development Goals from the viewpoint of four existing fields, i.e. urban governance, urban infrastructure management, health risk management, and disaster risk management. In addition, we#039ll provide lectures on this new discipline systematically based on the relationship between four existing fields.</p>					
<b>[Course objectives]</b>					
人間安全保障工学に関連した問題への実用的アプローチ法を習得する					
<b>[Course schedule and contents]</b>					
<p>Orientation(1time) Orientation, Self-Introduction and Photo Session</p> <p>Overview of Human Security Engineering(1time) What is Human Security Engineering? We will give brief answer to this question.</p> <p>Urban Governance(5times) Lecture on Human Right, Property and Social Capital, and Community Dimension of Human Security in Urban Context. Presentation by students and discussion will be also carried out.</p> <p>Urban Infrastructure Management(2times) The role and importance of urban infrastructure management for establishment of human security will be presented. Presentation by students and discussion will be also carried out.</p> <p>Health Risk Management(2times) The role and importance of health risk management for establishment of human security will be presented. Presentation by students and discussion will be also carried out.</p> <p>Disaster Risk Management(2times) The role and importance of disaster risk management for establishment of human security will be presented. Presentation by students and discussion will be also carried out.</p> <p>Technical tour(2times) Technical tour on human security engineering.</p>					
Continue to 人間安全保障工学概論(2)					

## 人間安全保障工学概論(2)

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### [Course requirements]

None

### [Evaluation methods and policy]

Participation, Presentation, and Report

### [Textbooks]

Not used

### [References, etc.]

( Reference books )

( Related URLs )

(<http://hse.gcoe.kyoto-u.ac.jp/en/inside/kyomu/index.html>)

### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG75 7X305 LB24				
<b>Course title (and course title in English)</b>	都市ガバナンス学各論 1 Lectures in Urban Governance 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
Custom-made Lecture This class will cover the hot topics on urban governance within human security engineering. Instructors will present current literature and expect students to develop arguments.					
<b>[Course objectives]</b>					
Acquire practical approaches to problems concerning urban governance within human security engineering					
<b>[Course schedule and contents]</b>					
Introduction(1time) The topics and study plan will be decided by discussion with the lecturer. The worth of the topics will be briefly summarized.					
Investigation, presentation, and discussion(13times) Students need to investigate the topics, make presentations on its results, and have discussions following the study plan.					
Final presentation(1time) Final presentation will be carried out, and final report will be submitted. They will be evaluated by the lecturer.					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Participations, discussions and report					
<b>[Textbooks]</b>					
Not used					
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Continue to 都市ガバナンス学各論 1 (2)					

## 都市ガバナンス学各論 1 (2)

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

This subject is custom-made. If you wish to take this, you must submit an “ Auditing Request Form for HSE Custom-made lecture ” per subject to the C Cluster Office. The form is available at the C Cluster Office.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG03 7X307 SB24					
<b>Course title (and course title in English)</b>	都市ガバナンス学各論 2 Lectures in Urban Governance 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
<p>Custom-made Lecture</p> <p>This class will cover the hot topics on urban governance within human security engineering. Instructors will present current literature and expect students to develop arguments.</p>						
<b>[Course objectives]</b>						
Acquire practical approaches to problems concerning urban governance						
<b>[Course schedule and contents]</b>						
<p>Introduction(1time)</p> <p>The topics and study plan will be decided by discussion with the lecturer. The worth of the topics will be briefly summarized.</p> <p>Investigation, presentation, and discussion(13times)</p> <p>Students need to investigate the topics, make presentations on its results, and have discussions following the study plan.</p> <p>Final presentation(1time)</p> <p>Final presentation will be carried out, and final report will be submitted. They will be evaluated by the lecturer.</p>						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Participations, discussions, and report						
<b>[Textbooks]</b>						
Not used						
<b>[References, etc.]</b>						
<p>( Reference books )</p> <p>Introduced during class</p>						
<p style="text-align: right;">Continue to 都市ガバナンス学各論 2 (2)</p>						

## 都市ガバナンス学各論 2 (2)

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### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

This subject is custom-made. If you wish to take this, you must submit an “ Auditing Request Form for HSE Custom-made lecture ” per subject to the C Cluster Office. The form is available at the C Cluster Office.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG75 7X315 SE73				
<b>Course title (and course title in English)</b>	都市基盤マネジメント学各論1 Lectures in Urban Infrastructure Management 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>Custom-made Lecture</p> <p>This class aims to deepen the understanding on urban infrastructure management, especially related to human security engineering. The class will present and discuss hot topics and related literatures on urban infrastructure management.</p>					
<b>[Course objectives]</b>					
Acquire practical approaches to problems concerning urban infrastructure management related to human security engineering.					
<b>[Course schedule and contents]</b>					
<p>Introduction,(1time)</p> <p>The topics and study plan will be decided by discussion with the lecturer. The worth of the topics will be briefly summarized.</p> <p>Investigation, presentation, and discussion(13times)</p> <p>Students need to investigate the topics, make presentations on its results, and have discussions following the study plan.</p> <p>Final presentation(1time)</p> <p>Final presentation will be carried out, and final report will be submitted. They will be evaluated by the lecturer.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Participations, discussions, and report					
<p style="text-align: right;">Continue to 都市基盤マネジメント学各論1(2)</p>					

## 都市基盤マネジメント学各論1(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

This subject is custom-made. If you wish to take this, you must submit an “ Auditing Request Form for HSE Custom-made lecture ” per subject to the C Cluster Office. The form is available at the C Cluster Office.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG75 7X317 SE73				
<b>Course title (and course title in English)</b>	都市基盤マネジメント学各論2 Lectures in Urban Infrastructure Management 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>Custom-made Lecture</p> <p>In this class, the Assorted Instructors will provide lectures on the current situation and future prospect of the challenges of urban infrastructure management related to urban human security engineering. The aim of this class is to develop advanced and practical research capability of the students. To achieve this, they will be assigned with research subjects and will present and discuss their findings.</p>					
<b>[Course objectives]</b>					
Acquire practical approaches to problems concerning urban infrastructure management related to human security engineering.					
<b>[Course schedule and contents]</b>					
<p>Introduction(1time)</p> <p>The topics and study plan will be decided by discussion with the lecturer. The worth of the topics will be briefly summarized.</p> <p>Investigation, presentation, and discussion(13times)</p> <p>Students need to investigate the topics, make presentations on its results, and have discussions following the study plan.</p> <p>Final presentation(1time)</p> <p>Final presentation will be carried out, and final report will be submitted. They will be evaluated by the lecturer.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Participations, discussions and report					
<p style="text-align: right;">Continue to 都市基盤マネジメント学各論2(2)</p>					

## 都市基盤マネジメント学各論2(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

This subject is custom-made. If you wish to take this, you must submit an “ Auditing Request Form for HSE Custom-made lecture ” per subject to the C Cluster Office. The form is available at the C Cluster Office.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG75 7X323 SE24				
<b>Course title (and course title in English)</b>	健康リスク管理学各論1 Lectures in Health Risk Management 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>Custom-made Lecture</p> <p>This class will provide an overview of health risk management, especially as they relate to human security engineering. The class will present and discuss the hot topics and related literatures on health risk management.</p>					
<b>[Course objectives]</b>					
<p>Acquire practical approaches to problems concerning health risk management related to human security engineering.</p>					
<b>[Course schedule and contents]</b>					
<p>Introduction(1time)</p> <p>The topics and study plan will be decided by discussion with the lecturer. The worth of the topics will be briefly summarized.</p> <p>Investigation, presentation, and discussion(13times)</p> <p>Students need to investigate the topics, make presentations on its results, and have discussions following the study plan.</p> <p>Final presentation(1time)</p> <p>Final presentation will be carried out, and final report will be submitted. They will be evaluated by the lecturer.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Participations, discussions and report					
<p style="text-align: right;">Continue to 健康リスク管理学各論1(2)</p>					

## 健康リスク管理学各論1(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

This subject is custom-made. If you wish to take this, you must submit an “ Auditing Request Form for HSE Custom-made lecture ” per subject to the C Cluster Office. The form is available at the C Cluster Office.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG75 7X325 SE24					
<b>Course title (and course title in English)</b>	健康リスク管理学各論2 Lectures in Health Risk Management 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
<p>Custom-made Lecture</p> <p>This class will provide lectures on the current situation and future challenges of human health risk management from the viewpoint of urban human security engineering. The aim of this class is to develop the student ' s research capability. Students will be assigned academic and practical research subjects, and will then present and discuss their findings.</p>						
<b>[Course objectives]</b>						
Acquire practical approaches to problems concerning health risk management related to human security engineering.						
<b>[Course schedule and contents]</b>						
<p>Introduction(1time)</p> <p>The topics and study plan will be decided by discussion with the lecturer. The worth of the topics will be briefly summarized.</p> <p>Investigation, presentation, and discussion(13times)</p> <p>Students need to investigate the topics, make presentations on its results, and have discussions following the study plan.</p> <p>Final presentation(1time)</p> <p>Final presentation will be carried out, and final report will be submitted. They will be evaluated by the lecturer.</p>						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Participations, discussions and report						
<div style="text-align: right;">Continue to 健康リスク管理学各論2(2)</div>						

## 健康リスク管理学各論2(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

This subject is custom-made. If you wish to take this, you must submit an “ Auditing Request Form for HSE Custom-made lecture ” per subject to the C Cluster Office. The form is available at the C Cluster Office.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG75 7X335 SE24				
<b>Course title (and course title in English)</b>	災害リスク管理学各論1 Lectures in Disaster Risk Management 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>Custom-made Lecture</p> <p>This class aims provide an overview of disaster risk management, with an emphasis on human security problems. The class will present and discuss hot topics and related literatures on disaster risk management</p>					
<b>[Course objectives]</b>					
Acquire practical approaches to problems concerning disaster risk management related to human security engineering.					
<b>[Course schedule and contents]</b>					
<p>Introduction(1time)</p> <p>The topics and study plan will be decided by discussion with the lecturer.</p> <p>The worth of the topics will be briefly summarized.</p> <p>Investigation, presentation, and discussion(13times)</p> <p>Students need to investigate the topics, make presentations on its results, and have discussions following the study plan.</p> <p>Final presentation(1time)</p> <p>Final presentation will be carried out, and final report will be submitted. They will be evaluated by the lecturer.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Participations, discussions and report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
<p>( Reference books )</p> <p>Introduced during class</p>					
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Continue to 災害リスク管理学各論1(2)					

## 災害リスク管理学各論1(2)

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### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

This subject is custom-made. If you wish to take this, you must submit an “ Auditing Request Form for HSE Custom-made lecture ” per subject to the C Cluster Office. The form is available at the C Cluster Office.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG75 7X337 SE24					
<b>Course title (and course title in English)</b>	災害リスク管理学各論2 Lectures in Disaster Risk Management 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
<p>Custom-made Lecture</p> <p>This class will provide lectures on the current situation and future challenges of disaster risk management from the viewpoint of urban human security engineering. The aim of this class is to develop advanced and practical research capability of the students. To achieve this, they will be assigned with research subjects and will present and discuss their findings.</p>						
<b>[Course objectives]</b>						
Acquire practical approaches to problems concerning disaster risk management related to human security engineering.						
<b>[Course schedule and contents]</b>						
<p>Introduction(1time)</p> <p>The topics and study plan will be decided by discussion with the lecturer. The worth of the topics will be briefly summarized.</p> <p>Investigation, presentation, and discussion(13times)</p> <p>Students need to investigate the topics, make presentations on its results, and have discussions following the study plan.</p> <p>Final presentation(1time)</p> <p>Final presentation will be carried out, and final report will be submitted. They will be evaluated by the lecturer.</p>						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
Participations, discussions and report						
<div style="text-align: right;">Continue to 災害リスク管理学各論2(2)</div>						

## 災害リスク管理学各論2(2)

### [Textbooks]

Not used

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

This subject is custom-made. If you wish to take this, you must submit an “ Auditing Request Form for HSE Custom-made lecture ” per subject to the C Cluster Office. The form is available at the C Cluster Office.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG55 7X339 PE73				
<b>Course title (and course title in English)</b>	人間安全保障工学インターンシップ Internship for Human Security Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
The internship aims to develop practical capabilities to secure urban human security, in addition to acquiring expert knowledge and the ability to develop new research fields by carrying out research activity related to human security engineering and presenting research results at international conferences. Specific examples include participating in internships domestically or abroad at companies or research institutes which conduct the operation of international projects, conducting field surveys, and attending academic conferences.					
<b>[Course objectives]</b>					
Acquire practical approaches to problems concerning human security engineering.					
<b>[Course schedule and contents]</b>					
<p>planning(1time) Attending seminars, presentations at international conferences, and internships are planned by students for this class.</p> <p>research and investigation(13times) Students attend seminars, make presentations at international conferences, and carry out internships to get practical knowledge and experiences.</p> <p>final report(1time) Students need to submit a report summarizing what they did and what they got in the activities.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Report					
<b>[Textbooks]</b>					
Not used					
<b>[References, etc.]</b>					
( Reference books )					
Introduced during class					
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Continue to 人間安全保障工学インターンシップ(2)					

## 人間安全保障工学インターンシップ(2)

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### [Study outside of class (preparation and review)]

Necessary information will be distributed in the class.

### ( Other information (office hours, etc.) )

Internship for Human Security Engineering normally requires 2 weeks (10 days) of on-site training or on-the-research training. Examples of this internship activities as follows: (a) Presentation at international conference followed by information collection relevant to your doctoral research at laboratories of foreign universities and authorities. (b) Normal internship activities at private companies to study the state of the cutting-edge technologies or practical business.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG55 7X341 SE73				
<b>Course title (and course title in English)</b>	アドバンスド・キャップストーン・プロジェクト Advanced Capstone Project		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	8	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>This class aims to develop the abilities of international collaboration, field investigation, and on-site planning/problem solving through long-term investigation/research activities related to human security engineering with thorough hands-on policy in foreign countries. Specific examples include field research at overseas centers and participation in international projects overseas. As a rule, participants will stay in the field for 2 months or more.</p>					
<b>[Course objectives]</b>					
Acquire practical approaches to problems concerning human security engineering.					
<b>[Course schedule and contents]</b>					
<p>planning(1time) Attending seminars, presentations at international conferences, and internships are planned by students for this class.</p> <p>research and investigation(13times) Students attend seminars, make presentations at international conferences, and carry out internships to get practical knowledge and experiences.</p> <p>final report(1time) Students need to submit a report summarizing what they did and what they got in the activities.</p>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Report					
<p style="text-align: right;">Continue to アドバンスド・キャップストーン・プロジェクト(2)</p>					

アドバンスド・キャップストーン・プロジェクト(2)

**[Textbooks]**

Not used

**[References, etc.]**

**( Reference books )**

Introduced during class

**[Study outside of class (preparation and review)]**

Necessary information will be distributed in the class.

**( Other information (office hours, etc.) )**

Advanced Capstone Projects require more than 2 months on-site or research training. Examples as follows:  
(a) Fieldwork at overseas base for your doctoral research. (b) Working as a visiting researcher at agencies/  
organizations related to Human Security Engineering.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG55 7X351 SE73				
<b>Course title (and course title in English)</b>	人間安全保障工学セミナーA Human Security Engineering Seminar A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
In the style of seminar, each student is given a theme for research related to human security problem to be solved by engineering methods, and the understanding on such a problems will be deepen from a specialized viewpoint of each student. Each student will get individual guidance by the supervisor about the method of the study on the problem or the collection method of the related information. Reports and presentation will be assigned after discussion with the supervisor.					
<b>[Course objectives]</b>					
To master the practical method to approach actual problems related to human security engineering.					
<b>[Course schedule and contents]</b>					
<p>Issue 1 setting (1 time) Set issue 1 on human security engineering that each student studies.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected issue 1.</p> <p>1st presentation (1 time) Each student presents the contents of survey and research on issue 1 to the teachers in charge and receives questions and evaluations.</p> <p>Task 2 setting (1 time) Set issue 2 on human security engineering that each student studies.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected issue 2.</p> <p>2nd presentation (1 time) Each student presents the contents of research and research on issue 2 to the teachers in charge and receives questions and evaluations.</p> <p>Issue 3 setting (1 time) Set issue 3 on human security engineering to be studied by each student.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected issue 3.</p>					
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Continue to 人間安全保障工学セミナーA(2)					

## 人間安全保障工学セミナーA(2)

The 3rd presentation (1 time)

Each student presents the contents of research and research on issu 3 to the teachers in charge, and receives questions and evaluations.

Issu 4 Setting (1 time)

Set issue 4 on human security engineering that each student studies.

Survey and progress report (1 time)

Each student conducts survey and research on selected issue 4.

The 4th presentation (1 time)

Each student presents the contents of survey and research on issu 4 to the teachers in charge and receives questions and evaluations.

Issu 5 Setting (1 time)

Set issue 5 on human security engineering that each student studies.

The 5th presentation (1 time)

Each student presents the contents of survey and research on issu 5 to the teachers in charge and receives questions and evaluations.

Feedback (1 time)

### [Course requirements]

None

### [Evaluation methods and policy]

Grade is evaluated comprehensively by the supervisor.

### [Textbooks]

Not appointed. Research papers will be given if necessary.

### [References, etc.]

( Reference books )

It will be introduced any time if necessary.

### [Study outside of class (preparation and review)]

Good preparation and enough review are required.

### ( Other information (office hours, etc.) )

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

Continue to 人間安全保障工学セミナーA(3)

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<b>Course number</b>	G-ENG55 7X352 SE73				
<b>Course title (and course title in English)</b>	人間安全保障工学セミナーB Human Security Engineering Seminar B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Associate Professor, YOKO SHIMADA	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
In the style of seminar, each student is given a theme for research related to human security problem to be solved by engineering methods, and the understanding on such a problems will be deepen from a specialized viewpoint of each student. Each student will get individual guidance by the supervisor about the method of the study on the problem or the collection method of the related information. Reports and presentation will be assigned after discussion with the supervisor.					
<b>[Course objectives]</b>					
To master the practical method to approach actual problems related to human security engineering.					
<b>[Course schedule and contents]</b>					
<p>Issue 1 setting (1 time) Set issue 1 on human security engineering that each student studies.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected issue 1.</p> <p>1st presentation (1 time) Each student presents the contents of survey and research on issue 1 to the teachers in charge and receives questions and evaluations.</p> <p>Task 2 setting (1 time) Set issue 2 on human security engineering that each student studies.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected issue 2.</p> <p>2nd presentation (1 time) Each student presents the contents of research and research on issue 2 to the teachers in charge and receives questions and evaluations.</p> <p>Issue 3 setting (1 time) Set issue 3 on human security engineering to be studied by each student.</p> <p>Survey and progress report (1 time) Each student conducts survey and research on selected issue 3.</p>					
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Continue to 人間安全保障工学セミナーB(2)					



## 人間安全保障工学セミナーB(2)

The 3rd presentation (1 time)

Each student presents the contents of research and research on issue 3 to the teachers in charge, and receives questions and evaluations.

Issue 4 Setting (1 time)

Set issue 4 on human security engineering that each student studies.

Survey and progress report (1 time)

Each student conducts survey and research on selected issue 4.

The 4th presentation (1 time)

Each student presents the contents of survey and research on issue 4 to the teachers in charge and receives questions and evaluations.

Issue 5 Setting (1 time)

Set issue 5 on human security engineering that each student studies.

The 5th presentation (1 time)

Each student presents the contents of survey and research on issue 5 to the teachers in charge and receives questions and evaluations.

Feedback (1 time)

### [Course requirements]

None

### [Evaluation methods and policy]

Grade is evaluated comprehensively by the supervisor.

### [Textbooks]

Not appointed. Research papers will be given if necessary.

### [References, etc.]

( Reference books )

It will be introduced any time if necessary.

### [Study outside of class (preparation and review)]

Good preparation and enough review are required

### ( Other information (office hours, etc.) )

Please check KULASIS for the information of office hour.

\*Please visit KULASIS to find out about office hours.

Continue to 人間安全保障工学セミナーB(3)

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<b>Course number</b>		G-ENG56 6V202 SE77			
<b>Course title (and course title in English)</b>	微小電気機械創製学 Introduction to the Design and Implementation of Micro-Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,YOKOKAWA RYUUJI Graduate School of Engineering Senior Lecturer,BANERJEE, Amit Graduate School of Engineering Associate Professor,HIROTANI JUN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This is a joint lecture with Hong Kong University of Science and Technology (HKUST) and Tsing-Hua University. A team consists of two students from each University work together to fulfill the assignment (design a microsystem) through paper survey, analysis, design, and presentation. A student can acquire not only the basic knowledge of a microsystem, but also comprehensive ability of English such as technical knowledge in English, skill for team work, and communication.					
<b>[Course objectives]</b>					
Acquire the knowledge and skill to design and analyze a microsystem.					
<b>[Course schedule and contents]</b>					
<p>* Tutorial on microsystem CAD software, 2times Master CAD program for microsystem design and analysis which will be utilized to accomplish an assignment.</p> <p>* Lecture and Task Introduction, 2times Learn basic knowledge necessary to design a microsystem/MEMS(Micro Electromechanical Systems) utilizing microfabrication technology.</p> <p>* Design and analysis work, 4times Analyze and design a microsystem by communicating with a team member of HKUST.</p> <p>* Presentation I, 2times The designed device and its analyzed results is presented in detail by team in English.</p> <p>* Evaluation of device, 3times Evaluate the fabricated microsystem.</p> <p>* Presentation II, 2times The measured results and comparison between the analyzed results of the fabricated microsystem is presented by team in English.</p>					
<b>[Course requirements]</b>					
Students are required to take the 10G204 course Microfabrication provided in 1st term.					
<b>[Evaluation methods and policy]</b>					
<b>【Evaluation method】</b> Evaluation will be based on presentations (60 points) and the end of the term assignments (40 points).					
<b>【Evaluation standard】</b> _ _ _ _ _					
Continue to 微小電気機械創製学(2)					

## 微小電気機械創製学(2)

Presentations are evaluated with not only design, simulation and measurement results of device, but also collaboration among their team members.

### [Textbooks]

Instructed during class

### [References, etc.]

#### ( Reference books )

Introduced during class

### [Study outside of class (preparation and review)]

The class is a problem-solving class. Learning and work outside the lecture hours are indispensable.

### ( Other information (office hours, etc.) )

For video conference for team presentation is going to be held 4th and 5th on Friday. Those who want to take this course have to take training course for CAD in advance. Those students who want to take this course has to contact Prof. Tsuchiya ([tutti@me.kyoto-u.ac.jp](mailto:tutti@me.kyoto-u.ac.jp)) by the end of 1st term.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG76 53237 LJ12   G-ENG76 53237 LJ13   G-ENG76 53237 LJ11				
<b>Course title (and course title in English)</b>	情報システムデザイン Information Systems Design		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Informatics Professor, Takayuki ITO Institute for Liberal Arts and Sciences Professor, TAJIMA KEISHI  Part-time Lecturer, MATSUBARA SHIGEO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course introduces fundamental concepts, methodologies and underlying technologies for analyzing, designing and implementing social information systems. In particular, the course presents fundamental concepts and methodologies regarding the basics of set data representation, design considering security and privacy protection, and incentive design. Students will examine design methodology and implementing/operation technologies to learn how information systems are designed, implemented and operated.					
<b>[Course objectives]</b>					
The student will understand the concepts and methodologies of the basics of set data representation, design considering security and privacy protection, and incentive design, which are used for the design and development of information systems.					
<b>[Course schedule and contents]</b>					
Basics of Set Data Representation (Tajima) 1. Set 2. Datalog 3. Redefining and extending sets by using relation and function Data System Design (Yoshikawa) 4. Operational vs. analytical data 5. Data models 6. Access control 7. Cryptographic tools 8. Privacy protection 9. Secret sharing Incentive Design (Matsubara) 10. Game theory basics 11. Incentive design for crowdsourcing 12. Security game: Stackelberg competition 13. Gamification: optimal contest design 14. Two-sided matching: kidney exchange 15. Information elicitation August 1 Final exam					
Continue to 情報システムデザイン(2)					

## 情報システムデザイン(2)

### [Course requirements]

None

### [Evaluation methods and policy]

Grading method: Grade is evaluated by the attendance of lectures and the final written exam. Evaluation criteria: Evaluation will be assessed on the basis of achievement level for course goals.

### [Textbooks]

Department of Social Informatics, Graduate School of Informatics, Kyoto University 『Information System Design Textbook』

### [References, etc.]

#### ( Reference books )

Yoav Shoham and Kevin Leyton-Brown 『Multiagent Systems: Algorithmic, Game-Theoretic, and Logical

### [Study outside of class (preparation and review)]

Prepare and review lectures by using the textbook.

### ( Other information (office hours, etc.) )

Contact with each professor in advance by email using the following addresses.

Tajima: [tajima@i.kyoto-u.ac.jp](mailto:tajima@i.kyoto-u.ac.jp)

Yoshikawa: [yoshikawa@i.kyoto-u.ac.jp](mailto:yoshikawa@i.kyoto-u.ac.jp)

Matsubara: [matsubara@i.kyoto-u.ac.jp](mailto:matsubara@i.kyoto-u.ac.jp)

オフィスアワーの詳細については、KULASISで確認してください。

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG76 63291 LJ73   G-ENG76 63291 LJ12   G-ENG76 63291 LJ24				
<b>Course title (and course title in English)</b>	防災・減災デザイン論 Designs for Emergency Management		<b>Instructor's name, job title, and department of affiliation</b>	Disaster Prevention Research Institute Professor,TATANO HIROKAZU Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI Disaster Prevention Research Institute Associate Professor,SAMADDAR , Subhajyoti Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO Disaster Prevention Research Institute Associate Professor,HIROI KEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
Damage from disasters is defined by two factors: scale of hazard and social vulnerability. Two strategies exist to reduce damage from disasters - namely, crisis management as a post-event countermeasure and risk management as a pre-event measure. This course introduces students to a system for effective emergency management, consisting of response, recovery, mitigation, and preparedness.					
<b>[Course objectives]</b>					
Understand risk and crisis management processes to maximize the capability of organizational operational continuity and requirements for effective support information system in emergency management.					
<b>[Course schedule and contents]</b>					
[1] What is emergency management? [2] Emergency management in disaster response [3] History of information processing in disaster response [4] Case study on emergency management in Great East Japan Earthquake 2011 [5] Case study on emergency management in recent disaster [6] Advanced emergency management with private support group 1 [7] Advanced emergency management with private support group 2 [8] Advanced emergency management with private support group 3 [9] Design of disaster response support systems 1 [10] Design of disaster response support systems 2 [11] Design of disaster response support systems 3 [12] Design of disaster response support systems 4 [13] Natural-hazard triggered technological accidents(Natech) [14] Business continuity plan, Standardization of disaster response [15] Examination					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
Every after lecture, please submit short report writing following things 1) Three points you could learn in this lecture, and reason -----					
Continue to 防災・減災デザイン論(2)					

## 防災・減災デザイン論(2)

2) What you would like to explain more?

Please send your short report to following address by following formats

1.address: report\_EM@dimisis.dpri.kyoto-u.ac.jp

2.subject: 「 Emergency Management Report “ date ” “ ID ” “ Name ”

3.No attach file

Deadline : Sunday of the next week

### [Textbooks]

Not used

### [References, etc.]

( Reference books )

土木学会土木計画学ハンドブック編集委員会 編 『土木計画学ハンドブック(2017)』(コロナ社)  
京大・NTTリジエンス共同研究グループ 『しなやかな社会の創造～災害・危機から生命、生活、事業を守る』(日経BP企画)

### [Study outside of class (preparation and review)]

Submit a short report about what they have learned in a lecture before next lecture.

### ( Other information (office hours, etc.) )

電子メールによる質問を受け付けています。(report\_EM@dimisis.dpri.kyoto-u.ac.jp)

\*Please visit KULASIS to find out about office hours.





計算論的學習理論(2)

**[Textbooks]**

**[References, etc.]**

( Reference books )

**[Study outside of class (preparation and review)]**

**( Other information (office hours, etc.) )**

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG76 63178 LE10					
<b>Course title (and course title in English)</b>	統計的学習理論 Statistical Learning Theory		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Informatics Professor, KASHIMA HISASHI Graduate School of Informatics Associate Professor, YAMADA MAKOTO		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Mon.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,4times, ,6times, ,5times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG76 63217 LE13   G-ENG76 63217 LE10   G-ENG76 63217 LE11				
<b>Course title (and course title in English)</b>	分散情報システム Distributed Information Systems		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Informatics Professor, YOSHIKAWA MASATOSHI Graduate School of Informatics Associate Professor, MA QIANG	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,10times, ,5times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



## デザインエスノグラフィ(2)

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### [Course requirements]

None

### [Evaluation methods and policy]

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG76 50025 LE44				
<b>Course title (and course title in English)</b>	マーケティングリサーチ Marketing Research		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Management Associate Professor, HAN, Hyun Jeong	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Thu.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This course (Marketing Research) is designed to give an overview or process of marketing in order to identify and solve marketing problems. It focuses not only on giving fundamental knowledge but also on applying its knowledge to marketing problems. It should be practical.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG76 57425 SJ46 G-ENG76 57425 SJ30				
<b>Course title (and course title in English)</b>	心理システムデザイン演習 Seminar on Psychology and Design Studies I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Education Professor,SAITOU SATORU Graduate School of Education Professor,KUSUMI TAKASHI Graduate School of Education Professor,Emmanuel MANALO Graduate School of Education Associate Professor,NOMURA MICHIO Institute for Liberal Arts and Sciences Associate Professor,TAKAHASHI YUUSUKE Graduate School of Education Assistant Professor,ISHIGURO SHO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG76 57426 SJ30 G-ENG76 57426 SJ46				
<b>Course title (and course title in English)</b>	心理システムデザイン演習 Seminar on Psychology and Design Studies II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Education Professor,SAITOU SATORU Graduate School of Education Professor,KUSUMI TAKASHI Graduate School of Education Professor,Emmanuel MANALO Graduate School of Education Associate Professor,NOMURA MICHIO Institute for Liberal Arts and Sciences Associate Professor,TAKAHASHI YUUSUKE Graduate School of Education Assistant Professor,ISHIGURO SHO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG76 57245 SJ46					
<b>Course title (and course title in English)</b>	心理デザインデータ解析演習 Seminar on Data Analysis in Psychology and Design Studies		<b>Instructor's name, job title, and department of affiliation</b>	Institute for Liberal Arts and Sciences Associate Professor, TAKAHASHI YUUSUKE		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester	
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG76 57295 LJ46 G-ENG76 57295 LJ30			
<b>Course title (and course title in English)</b>	認知機能デザイン論 Design of Cognitive Functions		<b>Instructor's name, job title, and department of affiliation</b>	Institute for the Future of Human Society Assistant Professor, UEDA RYUHEI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<p>本講義では、心理過程と生理学的な活動との対応関係を探る研究分野における、主要な方法論 - 具体的には、神経心理学や脳機能イメージングといった認知神経科学的手法 - を解説する。研究手法についての理解を深めた後に、前頭葉機能・記憶・情動・意思決定など、主に社会神経科学（Social Neuroscience）における知見を中心に概説する。これまでに得られている基礎的な知見に加え、発展的・建設的な思考能力を身につけることで、受講者がそれぞれの研究に活かせるようにすることを目的とする。</p> <p>また本講義では、英語によるTED talksも活用する。第一線の研究者による英語のプレゼンテーションを視聴することで、研究を俯瞰的にとらえると共に、研究を行う上で必要なスキルを意識する機会を提供する。</p>					
<b>[Course objectives]</b>					
<p>認知神経科学・社会神経科学の基礎を身につけ、自身の研究に活かせるようにする。          認知神経科学・社会神経科学の研究における発展的・建設的な思考能力を習得する。</p>					
<b>[Course schedule and contents]</b>					
<p>初回にオリエンテーションを行う。2週目以降は以下のような内容について授業を行う予定である。</p> <ol style="list-style-type: none"> <li>1. オリエンテーション</li> <li>2. 認知神経科学の研究手法：神経心理学による研究</li> <li>3. 認知神経科学の研究手法：fMRI</li> <li>4. 認知神経科学の研究手法：その他の脳機能の測定手法</li> <li>5. 前頭葉機能：下位領域の区分</li> <li>6. 前頭葉機能：機能の評価とこれまでの知見</li> <li>7. 記憶の神経機構</li> <li>8. 未来を展望する脳</li> <li>9. 情動の神経基盤</li> <li>10. 報酬と意思決定</li> <li>11. 選好判断のメカニズム</li> <li>12. 道徳的判断のメカニズム</li> <li>13. 文化神経科学</li> <li>14. 発達社会神経科学</li> <li>15. 講義全体のまとめ及びフィードバック</li> </ol> <p>なお各講義の終盤には、取り扱うトピックに関連する英語のTED talks（<a href="http://www.ted.com/talks">http://www.ted.com/talks</a>）を</p>					
Continue to 認知機能デザイン論 (2)					

## 認知機能デザイン論 (2)

教材として用いる。TED talksでは世界的に著名な研究者による優れた講演が行われており、最新の研究成果・現在のトレンド・英語によるプレゼンテーションの方法など、研究を行うために必要な多くの知識とスキルを学ぶ貴重な機会を提供するものである。

### [Course requirements]

None

### [Evaluation methods and policy]

平常点評価（50％）及びレポート（50％）。  
4回以上欠席した場合には単位を認めない。

### [Textbooks]

必要に応じて資料を配布する。

### [References, etc.]

#### （ Reference books ）

Introduced during class

### [Study outside of class (preparation and review)]

初回のオリエンテーション時に、教材として使用するTED talk（<http://www.ted.com/talks>）についての紹介を行う。予習は必須ではないが、繰り返し視聴することによって、理解を深めること。

### （ Other information (office hours, etc.) ）

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG76 57295 LJ46					
<b>Course title (and course title in English)</b>	デザイン心理学特論 Advanced Studies: Cognitive Sciences		<b>Instructor's name, job title, and department of affiliation</b>	Institute for the Future of Human Society Professor, UCHIDA YUKIKO		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester	
<b>Days and periods</b>	Wed.4	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG76 57294 SJ46 G-ENG76 57294 SJ63				
<b>Course title (and course title in English)</b>	脳機能デザイン演習 Seminar on Brain Function and Design Studies		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Education Associate Professor, NOMURA MICHIO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG56 8X468 PJ18				
<b>Course title (and course title in English)</b>	問題発見型/解決型学習(FBL/PBL)S 1 Field based Learning/Problem based Learning (FBL/PBL) S1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This seminar aims to deepen researchers' expertise and broaden their horizons in various fields through group activities. In particular, the seminar focuses on practicing the explanatory skills and logic required to make researchers in other fields understand it through practical presentations and debates.					
<b>[Course objectives]</b>					
Acquire explanatory and logical skills.					
<b>[Course schedule and contents]</b>					
Student introduction, 1-2 Classes Group formation, 1 Class Group activities, 10-12 Classes. Each group will set its own activity subject and discuss it within the group. Students will submit activity reports weekly. Presentation of results, 1-2 Classes. Results of the group activities will be presented before all students, and a question-and-answer session will be held.					
<b>[Course requirements]</b>					
None in particular					
<b>[Evaluation methods and policy]</b>					
Based on group activity reports and individual reports					
<b>[Textbooks]</b>					
Undecided					
<b>[References, etc.]</b>					
( Reference books ) Other					
<b>[Study outside of class (preparation and review)]</b>					
Group activities					
( Other information (office hours, etc.) )					
In principle, all lectures will be given in English. Students must apply for the course by the separately indicated deadline. For inquiries, please contact cme-seminar@me.kyoto-u.ac.jp					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG56 8X469 PJ18					
<b>Course title (and course title in English)</b>	問題発見型/解決型学習(FBL/PBL)S 2 Field based Learning/Problem based Learning (FBL/PBL) S2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN		
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	English	
<b>[Overview and purpose of the course]</b>						
This seminar aims to deepen researchers' expertise and broaden their horizons in various fields through group activities. In particular, the seminar focuses on practicing the explanatory skills and logic required to make researchers in other fields understand it through practical presentations and debates.						
<b>[Course objectives]</b>						
Acquire explanatory and logical skills.						
<b>[Course schedule and contents]</b>						
Student introduction, 1-2 Classes Group formation, 1 Class Group activities, 10-12 Classes. Each group will set its own activity subject and will discuss it within the group. Students will submit activity reports every week. Presentation of results, 1-2 Classes. Results of the group activities will be presented before all students, and a question-and-answer session is held.						
<b>[Course requirements]</b>						
None in particular						
<b>[Evaluation methods and policy]</b>						
Based on group activity reports and individual reports						
<b>[Textbooks]</b>						
Undecided						
<b>[References, etc.]</b>						
( Reference books ) Other						
<b>[Study outside of class (preparation and review)]</b>						
Group activities						
( Other information (office hours, etc.) )						
In principle, all lectures will be given in English. Students must apply for the course by the separately indicated deadline. For inquiries, please contact <a href="mailto:cme-seminar@me.kyoto-u.ac.jp">cme-seminar@me.kyoto-u.ac.jp</a>						
*Please visit KULASIS to find out about office hours.						



<b>Course number</b>		G-ENG56 8X477 PJ18			
<b>Course title (and course title in English)</b>	問題発見型/解決型学習(FBL/PBL)L 1 Field based Learning/Problem based Learning (FBL/PBL) L1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Through FBL (Field-based Learning), students of this course will experience the process of discovering problems to be solved from given real-world situations in teams, acquire design theory and design methods, and through PBL (Problem-based Learning), learn design theory and design methods by experiencing the process of solving a given practical problem in teams.</p> <p>The objectives of this course are as follows.</p> <p>In FBL, to (1) observe and analyze a given real-world situation to understand the structure of the situation and discover the root cause of the problem to be solved; (2) acquire the design theory necessary for discovering the problem, (3) learn the design methods necessary to discover the problem and practice them in the project, and (4) define a realistically solvable problem.</p> <p>In PBL: to (1) acquire the design theory necessary for problem-solving; (2) acquire the design methods required for problem-solving and implement them in projects; and (3) formulate feasible solutions.</p>					
<b>[Course objectives]</b>					
<ul style="list-style-type: none"> <li>• Using the design theory and design techniques that they have learned to identify real problems in society, define them as solvable problems, and formulate feasible solutions.</li> <li>• Communicating fluently with members from different fields of expertise, sharing problems and working together to solve them.</li> <li>• Understanding their role in response to the needs of society and within the team. Effectively communicate the contents of the team's work to third parties both inside and outside the university.</li> </ul>					
<b>[Course schedule and contents]</b>					
<p>Introduction, 1 Class</p> <p>The outline of this exercise and how to proceed with the project will be explained. We will also address the handling of intellectual property.</p> <p>FBL/PBL Practice (13 Classes)</p> <p>FBL/PBL conducted for each project. There will be weekly, discrete, intensive, or other forms of implementation based on the individual project, which should be conducted accordingly.</p> <p>Presentations, 1 Class</p> <p>Presentation of the results for each project.</p>					
<b>[Course requirements]</b>					
<p>None in particular. However, students are expected to have analytical and problem-solving abilities in their own specialized fields.</p> <p>Since specific course plans (programs) vary every year, details will be posted on Panda under "Field-Based Learning/ Problem-Based Learning (FBL/PBL) L&lt;Architecture&gt;" as needed. Please coordinate with these</p>					
Continue to 問題発見型/解決型学習(FBL/PBL)L 1 (2)					

問題発見型/解決型学習(FBL/PBL)L 1 (2)

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schedules and set up your course schedule with the faculty member supervising the program's implementation.

**[Evaluation methods and policy]**

This course aims to acquire design theories and design methods by practicing design through FBL (Field-based Learning)/PBL (Problem-based Learning).

- Acquisition of methods for discovering and solving problems 50% (based on reports and exams)
- Quality of problem discovery and solution 20% (based on reports and exams)
- Contribution to teams: 30% (by faculty observation)
- Attendance of over 80% is a prerequisite for credit (based on attendance verification)

**[Textbooks]**

In addition, materials used in practical training shall be distributed as necessary.

**[References, etc.]**

**( Reference books )**

In addition, materials used in practical training shall be distributed as necessary.

**( Related URLs )**

((Instructions will be given in class.))

**[Study outside of class (preparation and review)]**

The supervisor of each project will give instructions as appropriate. A mid-term presentation will be held in the middle of the semester to provide an opportunity for students to share information and get feedback from others. In principle, all participants are required to attend the mid-term presentation.

**( Other information (office hours, etc.) )**

The relevant subjects and schedule implemented shall be posted under field-Based Learning/ Problem-Based Learning (FBL/PBL) L<Architecture> on Panda at the beginning of the semester. Students should register for the course and apply to participate after confirming the details. Email addresses and other information will also be posted there. Students who wish to take the course should read it carefully. Specific questions, etc., will go through appointments, and we will accept questions via email, etc., as appropriate.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG56 8X478 PJ18			
<b>Course title (and course title in English)</b>	問題発見型/解決型学習(FBL/PBL)L 2 Field based Learning/Problem based Learning (FBL/PBL) L2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Through FBL (Field-based Learning), students of this course will experience the process of discovering problems to be solved from given real-world situations in teams, acquire design theory and design methods, and through PBL (Problem based Learning), learn design theory and design methods by experiencing the process of solving a given practical problem in teams.</p> <p>The objectives of this course are as follows.</p> <p>In FBL, to (1) observe and analyze a given real-world situation to understand the structure of the situation and discover the root cause of the problem to be solved; (2) acquire the design theory necessary for discovering the problem, (3) learn the design methods necessary to discover the problem and practice them in the project, and (4) define a realistically solvable problem.</p> <p>In PBL: to (1) acquire the design theory necessary for problem-solving; (2) acquire the design methods required for problem-solving and implement them in projects; and (3) formulate feasible solutions.</p>					
<b>[Course objectives]</b>					
<ul style="list-style-type: none"> <li>• Using the design theory and design techniques that they have learned to identify real problems in society, define them as solvable problems, and formulate feasible solutions.</li> <li>• Communicating fluently with members from different fields of expertise, sharing problems and working together to solve them.</li> <li>• Understanding their role in response to the needs of society and within the team. Effectively communicate the contents of the team's work to third parties both inside and outside the university.</li> </ul>					
<b>[Course schedule and contents]</b>					
<p>Introduction, 1 Class</p> <p>The outline of this exercise and how to proceed with the project will be explained. We will also address the handling of intellectual property.</p> <p>FBL/PBL Practice (13 Classes)</p> <p>FBL/PBL conducted for each project. There will be weekly, discrete, intensive, or other forms of implementation based on the individual project, which should be conducted accordingly.</p> <p>Presentations, 1 Class</p> <p>Presentation of the results for each project.</p>					
<b>[Course requirements]</b>					
<p>None in particular. However, students are expected to have analytical and problem-solving abilities in their own specialized fields.</p> <p>Since specific course plans (programs) vary every year, details will be posted on PandA under "Field-Based Learning/ Problem-Based Learning (FBL/PBL) L&lt;Architecture&gt;" as needed. Please coordinate with these</p>					
Continue to 問題発見型/解決型学習(FBL/PBL)L 2 (2)					

## 問題発見型/解決型学習(FBL/PBL)L 2 (2)

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schedules and set up your course schedule with the faculty member supervising the program's implementation.

### [Evaluation methods and policy]

This course aims to acquire design theories and design methods by practicing design through FBL (Field based Learning)/PBL (Problem based Learning).

- Acquisition of methods for discovering and solving problems 50% (based on reports and exams)
- Quality of problem discovery and solution 20% (based on reports and exams)
- Contribution to teams: 30% (based on faculty observation)
- Attendance of over 80% is a prerequisite for credit (based on attendance verification)

### [Textbooks]

In addition, materials used in practical training shall be distributed as necessary.

### [References, etc.]

#### ( Reference books )

In addition, materials used in practical training shall be distributed as necessary.

#### ( Related URLs )

((Instructions will be given in class.))

### [Study outside of class (preparation and review)]

The supervisor of each project will give instructions as appropriate. A mid-term presentation will be held in the middle of the semester to provide an opportunity for students to share information and get feedback from others. In principle, all participants are required to attend the mid-term presentation.

### ( Other information (office hours, etc.) )

The relevant subjects and schedule implemented shall be posted under field-Based Learning/ Problem-Based Learning (FBL/PBL) L<Architecture> on Panda at the beginning of the semester. Students should register for the course and apply to participate after confirming the details. Email addresses and other information will also be posted there. Students who wish to take the course, should read it carefully. Specific questions, etc., will go through appointments, and we will accept questions via email, etc., as appropriate.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG56 8X479 PB18				
<b>Course title (and course title in English)</b>	フィールドインターンシップL (デザイン学) Filed Internship L		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>"Field internships" is an attempt to utilize the "educational power of the field," and involve a group of people who spend several weeks or months in the field working on an international or social issue that involves different specializations. Students are individually required to find sites for internships and apply to them. Students shall submit a written plan in advance, participate in the internship, submit a report after the internship, and make a presentation at a debriefing session. Students will be dispatched to the internship location regardless of whether it is in Japan or overseas. Unlike previous internship programs with an individual focus, this program aims to develop leadership skills through group activities. This course also covers dispatch to overseas international organizations and training at overseas companies such as Aesthetics, AIESEC, and Vulcanus in Europe.</p> <p>The course objectives are to: (1) understand the structure of the situation and discover the root cause of problems to be solved by observing and analyzing the situation in the field, (2) implement the design theory and methods learned thus far in a project in the field, and (3) to define a realistically solvable problem in the field and formulate a feasible solution.</p>					
<b>[Course objectives]</b>					
The objective of field internships is to put the design theory and design methods already learned in practice to real problems in the field.					
<b>[Course schedule and contents]</b>					
<p>Introduction, 1 Class The outline of this subject and how to proceed with the project will be explained. We will also address the handling of intellectual property and crisis management education.</p> <p>Practical, 13 Classes Internships will be carried out for each project. There will be different forms of implementation based on the individual project, such as splitting field activities several times, which shall be conducted accordingly.</p> <p>Presentations, 1 Class Presentation of the results for each project.</p>					
<p style="text-align: right;">Continue to フィールドインターンシップL (デザイン学) (2)</p>					

## フィールドインターンシップL (デザイン学) (2)

### [Course requirements]

Only students who meet the schedule and other requirements for the intensive on-site training will be accepted.

### [Evaluation methods and policy]

Credit will be awarded based on whether the student has cultivated the flexibility and creativity needed in society, whether the student has developed the flexibility and assertiveness essential for group work, and whether the student has cultivated an international perspective and improved the ability to communicate with others internationally.

1 Status of the practice of design theory and design methods used to discover and solve problems 50% (based on reports and exams)

- Quality of problem discovery and solution 20% (based on reports and exams)
- Contribution to teams: 30% (based on observation by faculty or the person responsible at the dispatch site).

### [Textbooks]

In addition, materials used in internships shall be distributed as necessary.

### [References, etc.]

#### ( Reference books )

In addition, "フィールド情報学入門" Kyoritsu Shuppan 2009. "Filed Informatics" Springer 2011.

### [Study outside of class (preparation and review)]

Internships involve hands-on efforts in the real world. Therefore, before starting the internship, the participants should gather information about the subject and have a basic understanding of the local community. This information should be shared among the participants. It is essential to consider and share newly discovered events among the participants during the internship to further develop the implementation plan.

### ( Other information (office hours, etc.) )

Information regarding internship opportunities in this course will be communicated on the course website on PandA as needed. Prospective students or current students should read that carefully. The contact email address of the faculty member in charge of each field internship to be conducted will be provided separately.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG56 8X480 PB18			
<b>Course title (and course title in English)</b>	リサーチインターンシップL (デザイン学) Research-Intensive Abroad Internship L		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>Research internships aim to cultivate the ability to stay in the laboratory of an overseas research institution for a few weeks to a few months to search for the truth in boundary areas that cross existing academic fields from the perspective of design studies through joint research with local researchers and to organize and lead research teams in new research fields. To achieve this, students shall search for an internship at a prominent foreign research institute, an international collaboration partner of this university, and determine their host research institution while considering their joint research proposals, plans, and accommodations for the stay. Students must submit a research plan in advance and undergo a preliminary review from the relevant faculty member before participating in the internship. After the internship, they are expected to submit a report and present it in the debriefing session. Evaluation will consider each researcher's research results, as well as their contribution to the host institution. Participation in short-term intensive schools held at overseas partner universities shall also be considered.</p> <p>For this course, the decision on whether to dispatch a researcher shall be made through peer review by internal and external reviewers, including overseas reviewers, based on the following criteria: (1) the research proposal must be for a theme related to design studies that integrates multiple different fields, and (2) the plan must include joint research with an overseas research institution.</p>					
<b>[Course objectives]</b>					
<p>This course is an internship for conducting joint research at a host institute based on the following criteria: (1) the research proposal must be for a theme related to design studies that integrates multiple different fields, and (2) the plan must include joint research with an overseas research institution. Through joint research with overseas researchers, students will cultivate the ability to form dialogue and negotiate to communicate information in foreign cultures and different fields of study. In addition, the internship program cultivates a cooperative spirit for students to understand different cultures and fields and the cross-disciplinary vision to understand the "interrelationship of knowledge" among different fields based on the solid academic knowledge rooted in one's own culture and specialized field.</p>					
<b>[Course schedule and contents]</b>					
<p>Introduction, 1 Class Understanding the objectives and goals of the course, examining the details of the internship program, and implementing the plan for each student. We will also address the handling of intellectual property and crisis management education.</p> <p>Practice, 13 Classes The internship program will be conducted as needed based on the implementation plan.</p> <p>Presentation, 1 Class Students will submit reports on their internships and present their research results for feedback.</p>					
<p>-----</p> <p style="text-align: right;">Continue to リサーチインターンシップL (デザイン学) (2)</p>					

リサーチインターンシップL (デザイン学) (2)

**[Course requirements]**

Since this is an internship program, it is limited to students who can participate according to the schedule, venue, etc.

**[Evaluation methods and policy]**

Contents of joint research plan 50%.

Progress report during the dispatch 20%.

Results of the joint research and contribution to the host institution 30% (Based on the evaluation of the faculty member or the faculty member of the host institution).

**[Textbooks]**

In addition, materials used in internships shall be distributed as necessary.

**[References, etc.]**

**( Reference books )**

In addition, instructions will be provided during class.

**[Study outside of class (preparation and review)]**

Necessary preparation and review will be instructed as needed according to the details of the internship implementation plan.

**( Other information (office hours, etc.) )**

Information regarding internship opportunities in this course will be communicated on the course website on Panda as needed. Prospective students or current students should read that carefully.

\*Please visit KULASIS to find out about office hours.



<b>Course number</b>	G-ENG01 7X481 SJ18					
<b>Course title (and course title in English)</b>	デザイン学特別演習I Design Science Exercise, Adv. 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUBARA ATSUSHI		
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
This course aims to familiarize students with research results, diverse research methods, and evaluation methods through discussions on the latest research, vital past research, and peripherally related areas, focusing on the research themes in various fields of design. Students will learn both conventional research methods and creative thinking and develop their problem-finding and -solving abilities through discussions with other students. About 15 lab seminars will be held for the first and second sessions of M1.						
<b>[Course objectives]</b>						
Students will learn to understand specific problems and solutions in relevant areas and how to identify and solve problems on their own.						
<b>[Course schedule and contents]</b>						
The 30 sessions of the course entail research, presentations, and discussions on design science; setting research themes and frames; conducting surveys and experiments; analyzing data; summarizing research results; and discussions of presentations at research conferences in Japan and overseas throughout the year.						
<b>[Course requirements]</b>						
Nothing in particular						
<b>[Evaluation methods and policy]</b>						
Through presentations and discussions at seminars, students will comprehensively judge their proficiency in research methods and evaluation methods and their ability to collect information, detect problems, and solve problems.						
<b>[Textbooks]</b>						
Instructions will be given during the exercises.						
<b>[References, etc.]</b>						
( Reference books )						
Instructions will be given during the exercises.						
<b>[Study outside of class (preparation and review)]</b>						
Instructions will be given during the exercises.						
( Other information (office hours, etc.) )						
Instructions will be given during the exercises.						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>		G-ENG01 7X482 SJ18			
<b>Course title (and course title in English)</b>	デザイン学特別演習II Design Science Exercise, Adv. 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MATSUBARA ATSUSHI	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Seminar	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
This course provides research guidance to students in various design fields on setting goals, research themes, and methodology. It covers basic thesis writing techniques for students presenting research results to external academic conferences and other institutions. Students will learn to conduct and disseminate research by thoroughly discussing the position of their research themes in the relevant field, the significance of the results obtained, and future development potential. Before and after M2, we hold about 30 laboratory seminars.					
<b>[Course objectives]</b>					
Students must be able to set their own goals regarding how and to what extent they should solve problems they have discovered in the fields related to their research themes. In addition, students should be able to properly present the problem and acquire skills for efficiently solving problems through discussion.					
<b>[Course schedule and contents]</b>					
Research, presentations, and discussions on design science (15 sessions): These cover setting research themes and frames, conducting surveys and experiments, analyzing and interpreting data, summarizing research results, and discussing presentations at research conferences in Japan and overseas throughout the year.					
<b>[Course requirements]</b>					
As a general rule, you will be taking Design Special Exercise I.					
<b>[Evaluation methods and policy]</b>					
Through presentations and discussions at seminars, students will comprehensively judge their proficiency in research and evaluation methods and their ability to collect information, detect problems, and solve problems.					
<b>[Textbooks]</b>					
Other instructions will be given during the exercises.					
<b>[References, etc.]</b>					
( <b>Reference books</b> ) Other instructions will be given during the exercises.					
<b>[Study outside of class (preparation and review)]</b>					
Through presentations and discussions at seminars, students will comprehensively judge their proficiency in research and evaluation methods and their ability to collect information, detect problems, and solve problems.					
( <b>Other information (office hours, etc.)</b> )					
Other instructions will be given during the exercises.					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG01 8X483 PJ18				
<b>Course title (and course title in English)</b>	オープンイノベーション実習 1 Open Innovation Practice 1		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<p>To discover and solve real problems in society concerning design activities, we will ask relevant experts or stakeholders to create teams for open innovation and conduct a series of workshops to achieve the goal. The students' role is not to participate in problem-solving or problem-finding as an expert but simply to form and manage the above-mentioned teams for open innovation. Through this, the students will develop their communication and management skills, as well as learn the design theory and design methods to lead design activities to success through practice.</p> <p>The objectives of this course are for students to (1) understand the structure of a situation, identify experts and stakeholders who can discover the root cause of the problem, and form a team for open innovation by observing and analyzing a given real-world situation; and (2) learn to apply the design theories and methods necessary for discovering and solving the problem in project management and support the open innovation team in defining and solving the problem.</p>					
<b>[Course objectives]</b>					
The objective of this course is to manage the practice of design and acquire design theory and design methods through open innovation practice.					
<b>[Course schedule and contents]</b>					
<p>Introduction, 1 Class The outline of this subject and how to proceed with the project will be explained. We will also address the handling of intellectual property.</p> <p>Practical, 13 Classes Open innovation practical training will be carried out for each project. There will be different forms of implementation based on the individual project, such as splitting field activities several times, which shall be conducted accordingly.</p> <p>Presentations, 1 Class Presentation of the results for each project.</p>					
Continue to オープンイノベーション実習 1 (2)					

## オープンイノベーション実習 1 (2)

### [Course requirements]

Experience in Problem-Based Learning/Solution-Based Practice (FBL/PBL)  
Students should have obtained credits for the common Design Studies course "Design Methodology".

### [Evaluation methods and policy]

Mastery of management techniques for problem finding and solving processes 50% (based on reports and exams)  
Quality of management 20% (based on reports and exams)  
Contribution to the open innovation team 30% (through faculty observation).

### [Textbooks]

In addition, materials used in practical training shall be distributed as necessary.

### [References, etc.]

#### ( Reference books )

In addition, materials used in practical training shall be distributed as necessary.

#### ( Related URLs )

((Instructions will be given in class.))

### [Study outside of class (preparation and review)]

Instructions will be given in class.

### ( Other information (office hours, etc.) )

Information regarding counseling for this course and practice planning will be communicated on the course website on Panda as needed. Prospective students or current students are advised to read that carefully. The contact email address of the instructor directly in charge of each practice will be provided separately.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG01 8X484 PJ18					
<b>Course title (and course title in English)</b>	オープンイノベーション実習 2 Open Innovation Practice 2		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering KANKEI KYOIN		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Practical training		<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>						
<p>To discover and solve real problems in society concerning design activities, we will ask relevant experts or stakeholders to create teams for open innovation and conduct a series of workshops to achieve the goal. The students' role is not to participate in problem-solving or problem finding as an expert but simply to form and manage the above-mentioned teams for open innovation. Through this, the students will develop their communication and management skills, as well as learn the design theory and design methods to lead design activities to success through practice.</p> <p>The objectives of this course are for students to (1) understand the structure of a situation, identify experts and stakeholders who can discover the root cause of the problem, and form a team for open innovation by observing and analyzing a given real-world situation; and (2) learn to apply the design theories and methods necessary for discovering and solving the problem in project management and support the open innovation team in defining and solving the problem.</p>						
<b>[Course objectives]</b>						
The objective of this course is to manage the practice of design and to acquire design theory and design methods through open innovation practice.						
<b>[Course schedule and contents]</b>						
<p>Introduction, 1 Class The outline of this subject and how to proceed with the project will be explained. We will also address the handling of intellectual property.</p> <p>Practical, 13 Classes Open innovation practical training will be carried out on for each project. There will be different forms of implementation based on the individual project, such as splitting field activities several times, which shall be conducted accordingly.</p> <p>Presentations, 1 Class Presentation of the results for each project.</p>						
<p style="text-align: right;">Continue to オープンイノベーション実習 2(2)</p>						

## オープンイノベーション実習 2 (2)

### [Course requirements]

Experience in Problem-Based Learning/Solution-Based Practice (FBL/PBL)

Students should have obtained credits for the common Design Studies course "Design Methodology".

### [Evaluation methods and policy]

Mastery of management techniques for problem finding and solving processes 50% (based on reports and exams)

Quality of management 20% (based on reports and exams)

Contribution to the open innovation team 30% (through faculty observation).

### [Textbooks]

In addition, materials used in practical training shall be distributed as necessary.

### [References, etc.]

#### ( Reference books )

In addition, materials used in practical training shall be distributed as necessary.

#### ( Related URLs )

((Instructions will be given in class.))

### [Study outside of class (preparation and review)]

Instructions will be given in class.

### ( Other information (office hours, etc.) )

Information regarding counseling for this course and practice planning will be communicated on the course website on Panda as needed. Prospective students or current students are advised to read that carefully. The contact email address of the instructor directly in charge of each practice will be provided separately.

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG56 56122 SE47 G-ENG56 56122 SE46				
<b>Course title (and course title in English)</b>	デザイン学コミュニケーションストラテジー Communication Strategies for Design Research		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Education Professor, Emmanuel MANALO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3daystimes,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG56 53254 LJ10			
<b>Course title (and course title in English)</b>	フィールド分析法 Field Analysis		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Informatics Professor,KANDA TAKAYUKI Graduate School of Informatics Professor,OHTE NOBUHITO Graduate School of Management Professor,MATSUI HIROYUKI Graduate School of Management Professor,YAMAUCHI YUTAKA Graduate School of Informatics Associate Professor,MA QIANG Graduate School of Informatics Associate Professor,Drazen Brscic Graduate School of Informatics Associate Professor,Lina Koyama Graduate School of Informatics Assistant Professor,NISHIZAWA HIDEAKI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Tue.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
As a methodology of field analysis required to make product designs of products, services and business in the real field, we give some lectures and related exercise which include field research methods (ethnography, surveys method), quantitative analysis methods (various statistical analysis methods) and model building and simulation methods. After learning of the target field selection, setting of the investigation, and determination of the contents of the survey, you carry out the field research work using ethnography, survey methods and so on. At the next step, you learn data analysis methods using field data obtained from the field works. Finally, we hold the design workshop using the results of the actual field works which are obtained from construction of field analysis model, system dynamics, multi-agents simulation and so forth.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,4times, ,4times, ,3times,					
<b>[Course requirements]</b>					
None					
Continue to フィールド分析法(2)					



## フィールド分析法(2)

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### [Evaluation methods and policy]

### [Textbooks]

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>	G-ENG76 63165 LE12				
<b>Course title (and course title in English)</b>	パターン認識特論 Pattern Recognition, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Informatics Professor,KAWAHARA TATSUYA Graduate School of Informatics Professor,NISHINO KO Graduate School of Informatics Associate Professor,NOBUHARA SHOUHEI Graduate School of Informatics Associate Professor,YOSHII KAZUYOSHI	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Wed.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
We first explain fundamentals of pattern recognition, clustering methods with several distance measures, and discriminant functions with their learning methods. We then introduce advanced classifiers such as HMM, SVM and CRF and also related topics of machine learning theory, which includes EM learning, the MDL criteria, and Bayesian learning.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,3times, ,3times, ,3times, ,3times, ,3times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>		G-ENG76 63126 LE12			
<b>Course title (and course title in English)</b>	言語情報処理特論 Language Information Processing, Adv.		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Informatics Professor, KUROHASHI SADAOK Academic Center for Computing and Media Studies Professor, MORI SHINSUKE Graduate School of Informatics Senior Lecturer, MURAWAKI YUGO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/First semester
<b>Days and periods</b>	Mon.3	<b>Class style</b>	Lecture	<b>Language of instruction</b>	English
<b>[Overview and purpose of the course]</b>					
This lecture focuses on morphological analysis, syntactic analysis, semantic analysis, and context analysis, including machine learning approaches, which are necessary to process natural language texts. We also explain their applications such as information retrieval and machine translation.					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1time, ,2times, ,2times, ,2times, ,2times, ,2times, ,2times, ,1time, ,1time,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
-----					
Continue to 言語情報処理特論(2)					

## 言語情報処理特論(2)

### [References, etc.]

( Reference books )

### [Study outside of class (preparation and review)]

### ( Other information (office hours, etc.) )

\*Please visit KULASIS to find out about office hours.

<b>Course number</b>		G-ENG57 5X604 LJ60			
<b>Course title (and course title in English)</b>	材料化学基礎 Basic Material Chemistry		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,KONDOU TERUYUKI Graduate School of Engineering Associate Professor,KIMURA YUU	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.2	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1-3times, ,4-6times, ,7-8times, ,9-11times, ,12-13times, ,14times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG57 5X605 LJ60				
<b>Course title (and course title in English)</b>	生物分子解析学 Molecular Analysis of Life		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MORI YASUO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Second semester
<b>Days and periods</b>	Fri.1	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,1-6times, ,7-9times, ,10-13times, ,14-15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG57 6X671 EB77				
<b>Course title (and course title in English)</b>	総合医療工学分野特別実験および演習第一 Experiments and Exercises on Integrated Medical Engineering, Adv. I		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MORI YASUO	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG57 6X672 EB77				
<b>Course title (and course title in English)</b>	総合医療工学分野特別実験および演習第二 Experiments and Exercises on Integrated Medical Engineering, Adv. II		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MORI YASUO	
<b>Target year</b>		<b>Number of credits</b>	4	<b>Year/semesters</b>	2023/Intensive, year-round
<b>Days and periods</b>	Intensive	<b>Class style</b>	Experiment	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,30times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					



<b>Course number</b>	G-ENG57 6X681 SJ77				
<b>Course title (and course title in English)</b>	総合医療工学分野セミナー A (修士 ) Integrated Medical Engineering Seminar A		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MORI YASUO	
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG57 6X682 SJ77					
<b>Course title (and course title in English)</b>	総合医療工学分野セミナー B (修士 ) Integrated Medical Engineering Seminar B		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MORI YASUO		
<b>Target year</b>		<b>Number of credits</b>	1	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG77 6X683 SJ77				
<b>Course title (and course title in English)</b>	総合医療工学分野特別セミナーA Special Seminar A on Integrated Medical Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MORI YASUO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG77 6X684 SJ77					
<b>Course title (and course title in English)</b>	総合医療工学分野特別セミナーB Special Seminar B on Integrated Medical Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MORI YASUO		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						

<b>Course number</b>	G-ENG77 6X685 SJ77				
<b>Course title (and course title in English)</b>	総合医療工学分野特別セミナーC Special Seminar C on Integrated Medical Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor,MORI YASUO	
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, First semester
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese
<b>[Overview and purpose of the course]</b>					
<b>[Course objectives]</b>					
<b>[Course schedule and contents]</b>					
,15times,					
<b>[Course requirements]</b>					
None					
<b>[Evaluation methods and policy]</b>					
<b>[Textbooks]</b>					
<b>[References, etc.]</b>					
( Reference books )					
<b>[Study outside of class (preparation and review)]</b>					
<b>( Other information (office hours, etc.) )</b>					
*Please visit KULASIS to find out about office hours.					

<b>Course number</b>	G-ENG77 6X686 SJ77					
<b>Course title (and course title in English)</b>	総合医療工学分野特別セミナーD Special Seminar D on Integrated Medical Engineering		<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Engineering Professor, MORI YASUO		
<b>Target year</b>		<b>Number of credits</b>	2	<b>Year/semesters</b>	2023/Intensive, Second semester	
<b>Days and periods</b>	Intensive	<b>Class style</b>	Lecture	<b>Language of instruction</b>	Japanese	
<b>[Overview and purpose of the course]</b>						
<b>[Course objectives]</b>						
<b>[Course schedule and contents]</b>						
,15times,						
<b>[Course requirements]</b>						
None						
<b>[Evaluation methods and policy]</b>						
<b>[Textbooks]</b>						
<b>[References, etc.]</b>						
( Reference books )						
<b>[Study outside of class (preparation and review)]</b>						
<b>( Other information (office hours, etc.) )</b>						
*Please visit KULASIS to find out about office hours.						