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
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
A222	水資源システム論	Water Resources Systems Analysis
A402	資源開発システム工学	Resources Development Systems
A405	地殻環境工学	Environmental Geosphere Engineering
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
F077	流域治水砂防学	River basin management of flood and sediment
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
F088	地球資源学	Earth Resources Engineering
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
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
F267	水文気象防災学	Hydro-meteorologically based Disaster Prevention
F380	強靭な国づくりのためのｴﾝｼﾞﾆｱﾘﾝｸﾞｾﾐﾅｰ	Engineering Seminar for Disaster Resilience in ASEAN countrie
F382	安寧の都市のための災害及び健康ﾘｽｸﾏﾈｼﾞﾒﾝﾄ	Disaster and Health Risk Management for Liveable City
F405	ジオフロント工学原論	Fundamental Geofront Engineering
F415	環境材料設計学	Ecomaterial Design
F462	海岸波動論	Coastal Wave Dynamics
F464	水工計画学	Hydrologic Design and Management
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

科目コード /Code	科目名(和文) ／ Course Title	
U059	社会基盤工学インターンシップ	Internship on Infrastracture Engineering
U060	社会基盤工学ＯＲＴ	ORT on Infrastructure Engineering
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 Enivironmental Engineering Lab.
F472	環境工学実践セミナー	Seminer on Practical Issues in Urban and Environmental Enginering
F475	都市環境工学ORT	ORT on Urban and Environmental Engineering
H424	環境資源循環技術	Environmental-friendly Technology for Sound Material Cycle
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		
A832	構造材料特論	Theory of Structural Materials, Adv.
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
B015	建築環境計画論Ⅱ	Theory of Architectural and Environmental Planning II
B016	建築論特論	Theory of Architecture, Adv.
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

科目コード /Code	科目名(和文)	／ Course Title
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
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	熱物理工学	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
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	光物理工学	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
Q402	乱流力学	Turbulence Dynamics
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	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞセミナーＡ	Seminar on Micro Engineering A
G217	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞセミナーＢ	Seminar on Micro Engineering B
G223	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ基礎セミナーA	Basic Seminar on Micro Engineering A
G224	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ基礎セミナーB	Basic Seminar on Micro Engineering B
G226	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別実験及び演習第一	Experiments on Micro Engineering, Adv. I
G228	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ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	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別演習Ａ	Advanced Exercise in Micro Engineering A
V211	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別演習Ｂ	Advanced Exercise in Micro Engineering B

科目コード /Code	科目名(和文)　／ Course Title	
V212	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別演習Ｃ	Advanced Exercise in Micro Engineering C
V213	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別演習Ｄ	Advanced Exercise in Micro Engineering D
V214	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別演習Ｅ	Advanced Exercise in Micro Engineering E
V215	ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別演習Ｆ	Advanced Exercise in Micro Engineering F
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
C018	中性子科学	Neutron Science
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
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

科目コード /Code	科目名(和文) ／ Course Title	
電気工学専攻 / Electrical Engineering		
C601	電気数学特論	Applied Mathematics for Electrical Engineering, Adv.
C604	応用システム理論	Applied Systems Theory
C610	電磁気学特論	Electromagnetic Theory, Adv.
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
C614	生体機能工学	Biological Function 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
C714	時空間メディア解析特論	Spacio-tempral Data Analysis for Multimedia
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.
C816	分子エレクトロニクス	Molecular Electronics
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
H042	有機金属化学２	Organotransition Metal Chemistry 2
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
H013	無機構造化学	Chemistry and Structure of Inorganic Compounds
H022	有機天然物化学	Chemistry of Organic Natural Products
H031	生体材料化学	Chemistry of Biomaterials
H034	材料解析化学II	Analysis and Characterization of Materials II
P057	材料化学特論第三	Material Chemistry Adv. III
P058	材料化学特論第四	Material Chemistry Adv. IV
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

科目コード /Code	科目名(和文) ／ Course Title	
物質エネルギー化学専攻 / Energy and Hydrocarbon Chemistry		
D228	物質エネルギー化学特論第一	Energy and Hydrocarbon Chemistry, Adv. I
D229	物質エネルギー化学特論第二	Energy and Hydrocarbon Chemistry, Adv. II
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
H200	電気化学特論	Electrochemistry, Adv.
H202	物質環境化学	Green and Sustainable Chemistry
H205	無機固体化学	Inorganic Solid-State Chemistry
H208	物質エネルギー化学特別セミナーA	Seminar on Energy & Hydrocarbon Chemistry (A)
H213	有機触媒化学	Catalysis in Organic Reactions
H215	機能性界面化学	Chemistry of Functional Interfaces
H218	固体触媒設計学	Material Design of Solid Catalysts
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
D439	分子工学特論第一A	Molecular Engineering, Adv. IA
D445	分子工学特論第一B	Molecular Engineering, Adv. IB
H401	統計熱力学	Statistical Thermodynamics
H405	量子化学Ⅰ	Quantum Chemistry I
H408	分子分光学	Molecular Spectroscopy
H416	分子触媒学	Catalysis Science at Molecular Level
H422	分子材料科学	Molecular Materials Science
H427	量子物質科学	Quantum Materials Science
H428	分子レオロジー	Molecular Rheology
H430	分子細孔物理化学	Molecular Porous Physical Chemistry
H431	Molecular Porous Physical Chemistry	Molecular Porous 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
P440	分子工学特論第七	Molecular Engineering, Adv. VII
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 Supermolecular 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
H647	高分子制御合成	Polymer Controlled Synthesis
H649	高分子合成	Polymer Synthesis
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 Supermolecular 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 Seminor I
P652	高分子科学セミナーII	Polymer Science Seminor 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
D839	合成・生物化学特論Ａ	Synthetic Chemistry and Biological Chemistry, Adv,A
D841	合成・生物化学特論Ｃ	Synthetic Chemistry and Biological Chemistry, Adv,C
D843	合成・生物化学特論Ｅ	Synthetic Chemistry and Biological Chemistry, Adv,E
H802	有機設計学	Organic System Design
H804	有機合成化学	Synthetic Organic Chemistry
H808	物理有機化学	Physical Organic Chemistry
H816	生物工学	Microbiology and Biotechnology

科目コード /Code	科目名(和文) ／ Course Title	
H817	Microbiology and Biotechnology	Microbiology and Biotechnology
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		
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
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
H002	移動現象特論	Advanced Topics in Transport Phenomena
H005	分離操作特論	Separation Process Engineering, Adv.
H009	Chemical Reaction Engineering, Adv.	Chemical Reaction Engineering, Adv.(English lecture)
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
H030	化学工学特論第一	Special Topics in Chemical Engineering I
H035	化学工学特論第四	Special Topics in Chemical Engineering IV
H053	プロセスデータ解析学	Process Data Analysis
H420	集積化学プロセス	Integrated Chemical Processes
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
T005	化学工学特別セミナー２	Special Seminar in Chemical Engineering 2
T006	化学工学特別セミナー３	Special Seminar in Chemical Engineering 3
T009	化学工学特別セミナー６	Special Seminar in Chemical Engineering 6
T010	化学工学特別セミナー７	Special Seminar in Chemical Engineering 7
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		
H404	分子機能と複合・集積機能	Molecular Function and Composite-Assembly Function
H407	複合系の物理化学と解析技術	Physical Chemistry and Analytical Techniques of Complex Systems
H409	化学から生物へ生物から化学へ	Frontiers in the Field of Chemical Biology and Biological Chemistry
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)
P471	JGP計算実習(MO)	Japan Gateway Project Computation Exercise(MO)
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

科目コード /Code	科目名(和文) ／ Course Title	
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
W618	放射線治療計画・計測学実習	Radiation Treatment Planning, Radiation Treatment Metrology, Practice
W641	生理学	Physiology
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
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ﾌﾟ	Internship for Human Security Engineering
X341	ｱﾄﾞﾊﾞﾝｽﾄﾞ･ｷｬｯﾌﾟｽﾄｰﾝ･ﾌﾟﾛｼﾞｪｸﾄ	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
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)S１	Field based Learning/Problem based Learning (FBL/PBL) S1
X469	問題発見型/解決型学習(FBL/PBL)S２	Field based Learning/Problem based Learning (FBL/PBL) S2
X477	問題発見型/解決型学習(FBL/PBL)L１	Field based Learning/Problem based Learning (FBL/PBL) L1
X478	問題発見型/解決型学習(FBL/PBL)L２	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.
X466	デザイン心理学特論	Advanced Studies: Cognitive Sciences

融合工学コース / Interdisciplinary Engineering Course Program
- 総合医療工学分野 / Laboratory of Integrated Medical Engineering

科目コード /Code	科目名(和文) ／ Course Title	
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

Course number	G-ENG90 8i010 PE20		
Course title (and course title in English)	工学研究科国際インターンシップ１ International Internship in Engineering 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,NISHIKAWA MIKAKO

Target year		Number of credits	1	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

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 injury, please contact: nishikawa.mikako.7w@kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

Course number	G-ENG90 8i011 PE20		
Course title (and course title in English)	工学研究科国際インターンシップ２ International Internship in Engineering 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,NISHIKAWA MIKAKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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 priod of time.

[Course schedule and contents]

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.

[Course requirements]

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 injury, please contact: nishikawa.mikako.7w@kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG95 8i041 SE20		
Course title (and course title in English)	科学技術者のためのプレゼンテーション演習 Professional Scientific Presentation Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Senior Lecturer,NISHIKAWA MIKAKO Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

It is imperative for future engineers to be able to communicate and deliver effectively scientific information to large variety of audiences. This skill enables engineers to share and absorb information to more extended audiences, and facilitates success in selling ideas and products, publishing and team working. The purpose of this course is to teach the basic rules needed for successful professional scientific presentation, both orally and written. The course also prepares students to deliver scientific information presentations to wide audiences. The course is consisted of excessive exercises, of which the student should complete seven (7) tasks. The course holds 3-4 tasks for oral presentation exercises, and 3-4 tasks for professional scientific writing exercises. The exact number of both exercises is adjusted for each studentrsquos needs. The course is aimed for doctor course (DC) students, both Japanese and Foreign nationals

[Course objectives]

This course is aimed to foster engineering studentsrsquo scientific presentation skills. The successfully course completed students will be able to express and present complicated and specific scientific information at more generally understandable level. The students will also be able to pose relevant questions and effectively answer to the wide variety of questions.

[Course schedule and contents]

1time,Guidance and Professional presentation rules and etiquette
3times,Oral presentations amp questioning I, Written report I
3times,Oral presentations amp questioning II, Written report II
3times,Oral presentations amp questioning III, Written report III
3times,Oral presentations amp questioning IV, Written report IV
2times,Course summary and discussion

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)

[Course requirements]

-Fundamental skills about scientific presentation
 -Advanced English skills
 -Sufficient personal research results

[Evaluation methods and policy]

Reports, class activity, presentation

[Textbooks]

Course materials will be provided.

[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)]

3 times Oral, 4 times writing（Total 7 times）
or
3 times Oral, 4 times writing（Total 7 times）

（Other information (office hours, etc.)）

Students are requested to check in advance whether the credit of this course is counted as the unit for graduation requirement at department level. Course starts at April 12th, and the 1st lesson is repeated on April 19th. The course schedule is irregular. Most classes are biweekly, the detailed schedule is provided at the 1st lecture.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG90 8i042 SE20

Course title (and course title in English)	工学と経済（上級） Advanced Engineering and Economy	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,Juha Lintuluoto

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

This course is aimed to strengthen engineering studentsrsquo 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.

[Course schedule and contents]

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 wort 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

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 ldquoProject 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.

Course number	G-ENG90 8i045 SE20		
Course title (and course title in English)	実践的科学英語演習 I Exercise in Practical Scientific English I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,NISHIKAWA MIKAKO 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

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Thu.2	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Course Overview
Week 1: Introduction to writing scientific research articles
Introduction
Week 2: Researching a scientific topic and understanding the scientific register (genre, audience, purpose)
Preparing to Write
Week 3: Building a hypothesis and designing an experiment
Week 4: Discussing and evaluating proposals for experiments
Synthesizing
Week 5: Awareness of the register of scientific research articles (Exercise: Creating ow Corpus)
Week 6: Using citations and references for a formal writing
Writing Processes
Week 7: Writing Titles, Abstract of the proposed research
Week 8: Writing an Introduction section
Week 9: Writing a Method section
Week10: Writing an Anticipated Results & Implication section
Week11: Writing a Budget, time schedule section
Week12: Writing a cover letter to reviewers and how to respond to reviewers
Week13: Revising a paper based on peer feedback
Monitoring and Revising
Week14: Online feedback
Week15:Online feedback

Continue to 実践的科学英語演習 I (2)↓↓↓

実践的科学英語演習 I (2)

[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.

Course number	G-ENG90 8i045 SE20		
Course title (and course title in English)	実践的科学英語演習 I Exercise in Practical Scientific English I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,NISHIKAWA MIKAKO 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

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Thu.3	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Course Overview
Week 1: Introduction to writing scientific research articles
Introduction
Week 2: Researching a scientific topic and understanding the scientific register (genre, audience, purpose)
Preparing to Write
Week 3: Building a hypothesis and designing an experiment
week 4: Discussing and evaluating proposals for experiments
Synthesizing
Week 5: Awareness of the register of scientific research articles (Exercise: Creating ow Corpus)
Week 6: Using citations and references for a formal writing
Writing Processes
Week 7: Writing Titles, Abstract of the proposed research
Week 8: Writing an Introduction section
Week 9: Writing a Method section
Week10: Writing an Anticipated Results & Implication section
Week11: Writing a Budget, time schedule section
Week12: Writing a cover letter to reviewers and how to respond to reviewers
Week13: Revising a paper based on peer feedback
Monitoring and Revising
Week14: Online feedback
Week15: Online feedback

Continue to 実践的科学英語演習 I (2)↓↓↓

実践的科学英語演習 I (2)

[Course requirements]

Students who intend to join this course must attend the first class.
The class instruction may switch from in-person to remote if necessary.

[Evaluation methods and policy]

Evaluation based on 30% participation, 40% reports, 30% final paper *More than twice unexcused absence can result in course failure

[Textbooks]

Handout materials will be supplied by the instructor.

[References, etc.]

（Reference books）

Textbooks (for reference)

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.

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 will need to spend a reasonable amount of time to complete their own piece of writing for the course.

Tutorial session will be offered online.

（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-day guidance.

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

*Please visit KULASIS to find out about office hours.

Course number	G-ENG90 8i046 SE20		
Course title (and course title in English)	実践的科学英語演習II Exercise in Practical Scientific English II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,NISHIKAWA MIKAKO 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

Target year		Number of credits	1	Year/semesters	2021/Second semester
Days and periods	Mon.5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

This course is open to all master and doctoral engineering students.

The aim is to enhance students' abilities to disseminate scientific findings to a wider audience in English.

Throughout the course, feedback will be given to the presenter by different instructors specialized in Engineering.

The course will help students gain confidence in Oral English presentations on scientific topics.

Exercise for Practical Scientific English II: This course will be instructed remotely via zoom.

[Course objectives]

Throughout the course, students are expected to deliver an oral presentation about their research three times.

In each class, four or five students (depending on the total number of students in the class) will deliver an oral presentation (15 min) using the visual aid in front of a small group.

After each presentation, the audience, and the instructor(s) in the class will give some meaningful feedback (5 min).

In addition, each presentation will be videotaped. Students can monitor the progress by watching own video and can write a reflection paper at the end of the course.

In addition, we will have poster presentations scheduled at the end of the course.

[Course schedule and contents]

The course is constituted of three main parts:

Part 1. Introduction to Effective Presentation
A lecture is given on how to prepare an effective presentation including:

Continue to 実践的科学英語演習II(2)↓↓↓

実践的科学英語演習 II (2)

1. Presenting with purpose, 2. How to organize your message, 3. How to use transitional words and phrases, and 4. What to do for Questions and Answers.

Part 2. Oral presentation (12 classes)
Here are some focal points for each round of oral presentations: 1. Organization: Presentation should be structurally organized and contains information in a logical, interesting sequence which audience can follow, 2. Subject Knowledge: Students should be able to demonstrate the knowledge on the research topic with some degree of confidence, 3. Delivery: Students should be able to deliver a presentation that will merit the audience even if the audience does not come from the same research field.

Part 3. Poster presentation (2 classes)
Here are some criteria for poster presentations: 1. The layout of the information: The sequence of information should be logically organized and easy to follow, 2. A scientific knowledge: The poster should provide content suitable for non-experts, 3. Delivery: Students need to demonstrate knowledge and enthusiasm for their work.

[Course requirements]

This course is held in English. Students are expected to actively engage in class discussions.

[Evaluation methods and policy]

Evaluation:
30% participation (engaging the Q&As)
10% reflection paper,
30% poster presentation,
30% oral presentations

[Textbooks]

Handout materials will be supplied by the instructor.

[References, etc.]

（Reference books）

Donovan, J. (2014). How to deliver a TED talk. Mc Graw, Hill Education.

（Related URLs）

(None)

[Study outside of class (preparation and review)]

The digital syllabus contains schedule updates, useful tips, and materials (videos). The links to the digital syllabus will be notified during the first day of the course.

Continue to 実践的科学英語演習 II (3)↓↓↓

実践的科学英語演習 II (3)

（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.

Course number	G-ENG90 8i049 LE77
Course title (and course title in English)	エンジニアリングプロジェクトマネジメント Project Management in Engineering
Instructor's name, job title, and department of affiliation	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 Associate Professor,Juha Lintuluoto
Target year	
Number of credits	2
Year/semesters	2021/First semester
Days and periods	Fri.4
Class style	Lecture
Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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 becouse 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.

未更新

Course number	G-ENG95 8i051 SJ20		
Course title (and course title in English)	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)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Topic 1,2times,Detail will be announced later
Topic 2,2times,Detail will be announced later

[Course requirements]

None

[Evaluation methods and policy]

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.

[Textbooks]

Course materials will be provided.

[References, etc.]

（Reference books）

Will be indicated as necessary.

[Study outside of class (preparation and review)]

Will be indicated as necessary.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG95 8i052 SJ20		
Course title (and course title in English)	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)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Topic 1,2times,Detail will be announced later
Topic 2,2times,Detail will be announced later
Topic 3,2times,Detail will be announced later
Topic 4,2times,Detail will be announced later

[Course requirements]

None

[Evaluation methods and policy]

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.

[Textbooks]

Course materials will be provided.

[References, etc.]

（Reference books）

Will be indicated as necessary.

[Study outside of class (preparation and review)]

Will be indicated as necessary.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG90 8i055 LE77

Course title (and course title in English)	現代科学技術特論（4回コース） Advanced Modern Science and Technology (4 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

Target year		Number of credits	0.5	Year/semesters	2021/Second semester
Days and periods	Thu.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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. Group discussions will be done for further understanding of the topics of the course.
See website for further information. http://www.glc.t.kyoto-u.ac.jp/class/amst2020

[Course objectives]

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.

[Course schedule and contents]

Topic A:
Week 1-4, Numerical simulation
Topic B:
Week 5-8, Light and energy
Topic C:

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)

Week 9-12, Water environment

[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.
This year (2020), the course will be instructed remotely via zoom.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG90 8i056 LE77		
Course title (and course title in English)	現代科学技術特論（8回コース） Advanced Modern Science and Technology (8 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

Target year		Number of credits	1	Year/semesters	2021/Second semester
Days and periods	Thu.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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. Group discussions will be done for further understanding of the topics of the course.

[Course objectives]

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.

[Course schedule and contents]

Topic A:
Week 1-4, Numerical simulation
Topic B:
Week 5-8, Light and energy
Topic C:
Week 9-12, Water environment

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)

See website for further information. http://www.glc.t.kyoto-u.ac.jp/class/amst2020

[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.
This year (2020), the course will be instructed remotely via zoom.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG90 8i057 LJ20		
Course title (and course title in English)	安全衛生工学（4回コース） Safety and Health Engineering (4 times course)	Instructor's name, job title, and department of affiliation	Agency for Health, Safety and Environment Professor,HASHIMOTO SATOSHI Agency for Health, Safety and Environment Professor,MATSUI YASUTO

Target year		Number of credits	0.5	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,1time,
,1time,

[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.

未更新

Course number	G-ENG90 8i058 LJ20

Course title (and course title in English)	安全衛生工学（11回コース） Safety and Health Engineering (11 times course)	Instructor's name, job title, and department of affiliation	Agency for Health, Safety and Environment Professor,HASHIMOTO SATOSHI Agency for Health, Safety and Environment Professor,MATSUI YASUTO

Target year		Number of credits	1.5	Year/semesters	2021/First semester

Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

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)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG90 8i059 LE77		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	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 Associate Professor,Juha Lintuluoto

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.4,5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Week 1, Introduction to Exercise on Project Management in Engineering, Lecture on tools for the Project management in engineering, Practice and Project proposal.
Week 2, Group finalizations & Project selections.
Week 3-7, Group work, Project preliminary structures, Task list, WBS, Cost, Gant chart.
Week 8, Mid-term presentation.
Week 9-11, Group work, Leadership structuring, Risk Management, Environmental Impact Assessment.
Week 12, Presentation.
Each project group may freely schedule the group works within given time frame. The course instructors are available if any need is required.
Some lectures will be provided such as Task list, WBS, Cost, Gant chart, Leadership structuring, Risk Management, Environmental Impact Assessment, and more.

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.

未更新

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

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Thu.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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. Group discussions will be done for further understanding of the topics of the course.

[Course objectives]

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.

[Course schedule and contents]

Topic A:
Week 1-4, Numerical simulation
Topic B:
Week 5-8, Light and energy
Topic C:
Week 9-12, Water environment

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)

See website for further information. http://www.glc.t.kyoto-u.ac.jp/class/amst2020

[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.
This year (2020), the course will be instructed remotely via zoom.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG90 8i061 LE77		
Course title (and course title in English)	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)	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

Target year		Number of credits	0.5	Year/semesters	2021/First semester
Days and periods	Fri.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Theme A: Application of Materials
Week 1, Application of Electrical Discharge to Material and Environmental Technology
Week 2, Tumor Imaging and Therapy through Photoirradiation
Week 3, Application of Functional Oxides
Week 4, Group work / Exercise
Theme B: Material Development
Week 5, Synthesis of Novel π-Conjugated Molecules with Main Group Elements
Week 6, Chemistry of Asymmetric Catalysis #8211 Stereoselective Synthesis of Optically Active Pharmaceutical Compounds #8211
Week 7, New Timber Architecture with the Cross Laminated Timber
Week 8, Group work / Exercise
Theme C: Material energy and heat control
Week 9, Radioactive Waste, Geological disposal, Safety Assessment, Radionuclide Migration
Week 10, Photothermal heating for microfluidic control
Week 11, Wastewater, Energy and Resource Recovery, Methane Fermentation, Fertilizer
Week 12, Group work / Exercise

[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.

Continue to 先端マテリアルサイエンス通論（4回コース）(2)↓↓↓

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.

[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.

未更新

Course number	G-ENG90 8i062 LE77		
Course title (and course title in English)	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)	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

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Fri.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Theme A: Application of Materials
Week 1, Application of Electrical Discharge to Material and Environmental Technology
Week 2, Tumor Imaging and Therapy through Photoirradiation
Week 3, Application of Functional Oxides
Week 4, Group work / Exercise
Theme B: Material Development
Week 5, Synthesis of Novel π-Conjugated Molecules with Main Group Elements
Week 6, Chemistry of Asymmetric Catalysis #8211 Stereoselective Synthesis of Optically Active Pharmaceutical Compounds #8211
Week 7, New Timber Architecture with the Cross Laminated Timber
Week 8, Group work / Exercise
Theme C: Material energy and heat control
Week 9, Radioactive Waste, Geological disposal, Safety Assessment, Radionuclide Migration
Week 10, Photothermal heating for microfluidic control
Week 11, Wastewater, Energy and Resource Recovery, Methane Fermentation, Fertilizer
Week 12, Group work / Exercise

[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.

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)

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.

[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

[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.

未更新

Course number	G-ENG90 8i063 LE77		
Course title (and course title in English)	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)	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

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Fri.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Theme A: Application of Materials
Week 1, Application of Electrical Discharge to Material and Environmental Technology
Week 2, Tumor Imaging and Therapy through Photoirradiation
Week 3, Application of Functional Oxides
Week 4, Group work / Exercise
Theme B: Material Development
Week 5, Synthesis of Novel π-Conjugated Molecules with Main Group Elements
Week 6, Chemistry of Asymmetric Catalysis #8211 Stereoselective Synthesis of Optically Active Pharmaceutical Compounds #8211
Week 7, New Timber Architecture with the Cross Laminated Timber
Week 8, Group work / Exercise
Theme C: Material energy and heat control
Week 9, Radioactive Waste, Geological disposal, Safety Assessment, Radionuclide Migration
Week 10, Photothermal heating for microfluidic control
Week 11, Wastewater, Energy and Resource Recovery, Methane Fermentation, Fertilizer
Week 12, Group work / Exercise

[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

Continue to 先端マテリアルサイエンス通論（12回コース）(2)↓↓↓

will be informed in the advance.

[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

[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.

未更新

Course number	G-ENG01 6A019 LJ73　G-ENG02 6A019 LJ73		
Course title (and course title in English)	コンクリート構造工学 Concrete Structural Engineering	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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)

[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.

Course number	G-ENG02 7A040 LJ73　G-ENG01 7A040 LJ73		
Course title (and course title in English)	流砂水理学 Sediment Hydraulics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Global Environmental Studies Associate Professor,HARADA EIJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Introduction,1time,
The purpose and constitution of the lecture, the method of the scholastic evaluation are explained.

Basics of sediment hydraulics,5times,
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,8times,
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 cofirmation,1time,
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 studentrsquos 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.

未更新

Course number	G-ENG01 5A055 LB73　G-ENG02 5A055 LB73

Course title (and course title in English)	環境地盤工学 Environmental Geotechnics	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KATSUMI TAKESHI Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Students should understand the geotechnics to solve the following geoenvironmental issues; soil amp 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.

[Course schedule and contents]

Introduction,1time,Introduction to Environmental Geotechnics, including goals, outline and grading policy of the course
Waste geotechnics,3-4times,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,3-4times,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,2-3times,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,3-4times,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,2-3times,Student presentation, discussion, and summary on above topics

[Course requirements]

Having knowledge on soil mechanics and geotechnical engineering at bachelor level is preferable, but not requirement.

[Evaluation methods and policy]

Continuous assessment including attendance, some assignments, and final report

[Textbooks]

Not specified. Several technical papers related to the course will be distributed.

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環境地盤工学(2)

[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.

未更新

Course number	G-ENG02 5A222 LJ73　G-ENG01 5A222 LJ73				
Course title (and course title in English)	水資源システム論 Water Resources Systems Analysis	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,HORI TOMOHARU Disaster Prevention Research Institute Associate Professor,TANAKA KENJI		
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

A method to model the mechanisms of natural and social phenomena related to water resources as a system will be introduced, and lectures will be given on planning theory and management theory for the sustainable use of water resources. Specifically, first, after explaining the idea of systematically thinking about water resource-related problems, lectures will be given on the theory and methodology of the mathematical planning approach to water resource planning/management, as well as the water resource dynamics modeling relationship between water supply-demand balance and production/economic activity. Next, the evaluation method, simulation model, the comprehensive basin management method, and so forth that incorporate environmental elements such as water volume, water quality, ecology, and landscape, aiming to form a proper water circulation system throughout the basin, will be explained.

[Course objectives]

Understanding the fundamental techniques for modeling natural and social phenomena related to water resources as a system, and acquiring the ability to collect, analyze, and design data for the sustainable use of water resources.

[Course schedule and contents]

Optimal design theory of water management system (3 times)
Regarding the planning and design of a water management system consisting of facilities for water supply and water disaster prevention, lectures will be given about the method of finding the optimum configuration based on the performance index and the cost index, while paying attention to the setting and formulation of problems, the search method of a solution, and its efficiency.

Management of water resources system and decision support (2 times)
Discussions will be conducted about the management of the water resources system consisting of reservoirs and weirs for both flood defense and water use. Specifically, methods for optimizing operations of facility groups and coping with uncertainty will be explained, and the technology that supports management decision making based on recent technical trends, such as a knowledge base approach, fuzzy theory, and neural network, will also be explained.

Recent topics about water management (2 times)
Deepening understanding about recent topics related to water management and water disaster prevention with a focus on discussions among students. The problems to be covered will vary depending on the year.

World water management (3 times)
The actual condition of water resource management in various basins in various places around the world, climate conditions, geographical conditions, socio-economic development stages, problems, and examples of

Continue to 水資源システム論 (2)↓↓↓

past efforts will be introduced.

Land surface process model and its application to water management (4 times)
The method of maintenance of input parameters for operating the land surface process model, and the model describing the water circulation in the basin will be outlined, as well as how effective and useful model output elements, such as soil moisture content, evapotranspiration volume, irrigation necessary water volume, snow water volume, and runoff amount are as water resources management support information. Examples of the impact of climate change on water resources utilizing the land surface process model output will be introduced.

Confirmation of learning achievement (1 time)
The achievement degree will be evaluated according to assignments, and feedback will be provided.

[Course requirements]

It is desirable that students have basic knowledge on hydrology and water resource engineering.

[Evaluation methods and policy]

The results will be evaluated by combining regular tests and points given for participation.

[Textbooks]

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

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

It is necessary to review based on lecture materials and to complete the report assignments given during the lecture.

（Other information (office hours, etc.)）

The course is opened every year. It will be opened in 2019.

Active participation is expected in the lectures through questions and so forth. The content and number of lectures may change depending on circumstances. In addition, some lecture items may be replaced with special lectures given by researchers and others outside the university on current topics.

*Please visit KULASIS to find out about office hours.

Course number	G-ENG01 6A402 LJ77　G-ENG02 6A402 LJ77		
Course title (and course title in English)	資源開発システム工学 Resources Development Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MURATA SUMIHIKO Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

1st: From resource exploration to development and production
The engineering flow from exploration to development and production of mineral and energy resources that are indispensable for the sustainable development of human society is lectured. The 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 basic properties of reservoir rock, reservoir pressure, and oil and gas recovery factor, are explained.

3rd: Phase behavior of reservoir fluid
　PVT test, phase behavior, reservoir fluid properties, and equation of state for phase behavior calculation are explained.

4th: Basic equation of radial flow (Part 1)
　The basic equation of the radial flow of the reservoir fluid to a well is derived, and the well Inflow

Continue to 資源開発システム工学(2)↓↓↓

equations for the semi-steady state and steady state are described.

5th: Basic equations of radial flow (Part 2)
The basic equation of radial flow of oil to a well when the oil is produced at a constant production rate is solved, and then the Constant Terminal Rate Solution that gives the change with time of bottom pressure.

6th: Oil well testing (Part 1)
The basic concept of oil well testing and the basic equations used for the analysis are explained.

7th: Oil well testing (Part 2)
Exercise on the oil well testing analysis will be conducted.

8th: Gas well testing (Part 1)
The basic concept of gas well testing and the basic equations used for the analysis are explained.

9th: Gas well testing (Part 2)
Exercise on the gas well testing analysis will be conducted.

10th: Basic theory of immissible displacement in reservoir (Part 1)
Fractional flow theory and Buckley-Leverett equation for one-dimensional displacement of oil by water are explained, and Welge's method for the evaluation of oil recovery is explained.

11th: Basic theory of immissible displacement in reservoir (Part 2)
The oil displacement by water under the segregated flow condition, allowance for the effect of a finite capillary ttransition zone, and stratified reservoir condition is explained based on the fractional flow theory. The method to evalutate oil recovery under these reservoir conditions is also explained.

12th: Enhanced oil recovery
Various enhanced oil recovery methods such as chemical flooding, missible gas flooding 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.

[Course requirements]

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

Continue to 資源開発システム工学(3)↓↓↓

資源開発システム工学(3)

[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.

未更新

Course number	G-ENG01 6A405 LJ77		
Course title (and course title in English)	地殻環境工学 Environmental Geosphere Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI Part-time Lecturer,KINOSHITA MASATAKA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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 (3 times)

Continue to 地殻環境工学(2)↓↓↓

地殻環境工学(2)

The materials and pressure structure of the Earth will be reviewed, and the dynamics of the Earth including crustal deformation will be explained (1 time). Next, the deep crustal fluid, which is important for the thermal structure of the Earth, and the formation of mineral, oil, and gas deposits will be explained (2 times). [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.

7. Fundamentals of Geoinformatics (4) (Earth measurement/geochemical exploration) (1 time)
As a visualization method of the crustal structure, the Earth measurement method using a physical response, the inversion analysis method of data by this method, and the geochemical exploration method for extracting and analyzing chemical anomalies in the shallow part of the surface will be outlined. [Koike]

8. Geosphere environmental and resource problems (2 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. Additionally, since there are abundant mineral resources and energy resources, such as methane hydrate, that are also at the bottom of the sea and under the seabed, the structure of the oceanic crust and the method of exploration and development of marine resources, as well as the utilization situation of global resources and the resource problem will be covered, and a lecture will be given on natural energy using geothermal heat, and its advantages and disadvantages. [Koike and Hayashi]

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.

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地殻環境工学(3)

[Course requirements]
It is desirable that students have basic knowledge of geology, physics, and chemistry.

[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.

未更新

Course number	G-ENG01 6A805 LJ73　G-ENG02 6A805 LJ73

Course title (and course title in English)	リモートセンシングと地理情報システム Remote Sensing and Geographic Information Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,UNO NOBUHIRO Graduate School of Engineering Professor,SUSAKI JIYUNICHI Graduate School of Engineering Assistant Professor,KIMURA YUUSUKE

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

(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 suface 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 imagges 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)↓↓↓

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 oversee 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. Mitasova, Open Source GIS: A GRASS GIS Approach 3rd ed., The International Series in Engineering and Computer Science, 2008.

Continue to リモートセンシングと地理情報システム(3)↓↓↓

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.

未更新

Course number	G-ENG02 6A808 LJ73　G-ENG01 6A808 LJ73				
Course title (and course title in English)	景観デザイン論 Civic and Landscape Design		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASAKI MASASHI Graduate School of Engineering Associate Professor,YAMAGUCHI KEITA Part-time Lecturer,YAGI HIROKI	
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Lecture for Landscape Design, Design of Urban infrastructure, and Landscape Architecture Practice

[Course objectives]

Total points will be scored in results of design practice and reports.

[Course schedule and contents]

Guidance. Landscape and image,1time,Guidance, Lecture on landscape and image.
Architectural Design of city and urban facilities,3times,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,4times,The history of landscape policy, the method of evaluating landscape, the case and method of landscape planning, examples and methods of urban design both in Japan and abroad
Landscape Architecture Practice,6times,Designed for streets, parks
Feedback,1time,

[Course requirements]

None

[Evaluation methods and policy]

Reports (Kawasaki: 50%) and design practice (50%)

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

design practice and reports

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG02 5F003 LJ73　G-ENG01 5F003 LJ73		
Course title (and course title in English)	連続体力学 Continuum Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,YAGI TOMOMI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Fundamental theorems on structural mechanics and design will be learned, and ability to judge the proprieties of each computational structural analysis will be acquired.

[Course schedule and contents]

Introductions, 1time, Yagi
 - Outline of Structural Analysis
 - Mathematical Preliminaries (Vectors and Tensors)

Matrices and tensors, 1time, Yagi
 - Summation Convention
 - Eigenvalues and Eigenvectors

Differential and integral calculus of tensors, 1time, Yagi
 - Quotient Laws
 - Divergence Theorem

Kinematics, 1time, Yagi
 - Material Description
 - Spatial Description
 - Material derivative

Deformation and strain, 1times, Yagi
 - Strain tensors
 - Compatibility conditions

Stress and equilibrium equation, 1time, Yagi
 - Stress Tensors
 - Equilbrium Equations

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.

Course number	G-ENG01 6F009 LE73　G-ENG02 6F009 LE73		
Course title (and course title in English)	構造デザイン Structural Design	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Structural Planning,2times,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.
Structure and Form,3times,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.
Structural Design and Performance-based Design,3times,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.
Random Variables and Functions of Random Variables,1time,Fundamentals of random variables, functions of random variables, probability of failure and reliability index in their simplest forms are lectured.
Structural Safety Analysis,3times,Limit states, probability of failure, FOSM reliability index, Hasofer-Lind reliability index, Monte Carlo method are lectured.
Design Codes,2times,Code format as Load and Resistance Factors Design (LRFD) method, calibration of partial safety factors based on the reliability method are given.
Assessment of the Level of Attainment,1time,Assess the level of attainment.

[Course requirements]

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 amp 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, 2010Other 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.

Course number	G-ENG02 6F010 LE73　G-ENG01 6F010 LE73		
Course title (and course title in English)	橋梁工学 Bridge Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies 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

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Also, the basic knowledge for wind engineering and aerodynamic instabilities, which are necessary for the wind resistant design of bridges, will be acquired.

[Course schedule and contents]

Introduction(1, Sugiura)
 - Fundamental knowledge on steel structures
 - Types of steel structures
 - Future trend of steel structures
 - Stress-strain relationship
 - High performance steels

Failures of Steel Structures(1, Kitane)

Fabrication and Erection of Steel Structures(1, Sugiura)
 - Initial imperfections
 - Construction of steel structures
 - Residual stresses and initial deformations
 - Joints(welded and bolted)

Fatigue fracture, fatigue life and fatigue design(1, Kitane)
 - S-N design curve
 - Fatigue crack growth, stress intensity factor
 - Miner's rule on damage accumulation
 - Repair of fatigue damage

Structural stability and design for buckling(1, Kitane)

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-corrsion
 - 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 Fuid Dynamics(2, Noughi)
 - Fundamentals of CFD
 - Aplication 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.

Course number	G-ENG01 6F011 LE73　G-ENG02 6F011 LE73		
Course title (and course title in English)	数値流体力学 Computational Fluid Dynamics	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Course goal is to understand the basic theory and numerical procedures about CFD.

[Course schedule and contents]

(1) Computational method with FDM and FVM [7 times] :
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.

(2) Particle method - basic theory and improvements [7 times] :
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.

(3) Feedback [1 time] :
Discuss the contents of all classes and assignments. The details will be introduced in the course.

Continue to 数値流体力学(2)↓↓↓

数値流体力学(2)

[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.

未更新

Course number	G-ENG01 6F019 LJ73

Course title (and course title in English)	河川マネジメント工学 River Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KISHIDA KIYOSHI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU

Target year		Number of credits	2	Year/semesters	2021/First semester

Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

It is important to consider about rivers comprehensively from the various points of view based on natural amp social sciences and engineering amp technology. The fundamental knowledge to consider rivers and to make the plans for river basins is explained with the following contents: various view points 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 amp slope failure disasters, the integrated river basin planning(flood defense, environmental improvement planning, sediment transport system), functions of dam reservoir and management.

[Course objectives]

Students are requested to understand the fundamental knowledge to consider rivers and river basins comprehensively from the various points of view based on natural amp social sciences and engineering amp technology.

[Course schedule and contents]

Various view points to consider rivers and river basins,2times,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
Ecological system in rivers,1time,The fundamental knowledge on river ecologycal system
Applications of computational methods to environmental problems,2times,The following items are lectured: Computational method to predict river flows and river channel processes with sediment transport and river bed deformation, Hydrodynamics in Lake Biwa.
Recent flood disasters amp Integrated river basin planning,3times,Characteristics of 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,1time,Simulation technology of groundwater, Geo-environmental issues, Reservoir Engineering, Contaminant Transport Processes.
Sustainable development of dam,1time,Needs of dam development and history of dam construction, Maintenace of Dam reservoir.
Economic evaluation of environmental improvement projects,2times,Evaluation of people#039s awareness amp WTP to river improvement projects by means of CVM, Conjoint Analysis, etc.
Riverbank and Dam structure and its maintenance,2times,River bank and dam structure, foundation, grouting. Desighn of River bank, Arch Dam and Graviety Dam.
Achievement Confirmation and Feedback,1time,Comprehension check of course contents (Reports amp Quiz)

Continue to 河川マネジメント工学(2)↓↓↓

河川マネジメント工学(2)

[Course requirements]

Fundamental knowledge on Hydraulics, Hydrology and Ecology

[Evaluation methods and policy]

Reports amp Attendance

[Textbooks]

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

[References, etc.]

（Reference books）

（Related URLs）

(http://www.geocities.jp/kyoto_u_rivereng/)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Students can contact with professors by visiting their rooms and sending e-mails.
Prof. Hosoda: hosoda.takashi.4w@kyoto-u.ac.jp
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.

Course number	G-ENG01 5F025 LJ73　G-ENG02 5F025 LJ73		
Course title (and course title in English)	地盤力学 Geomechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MIMURA MAMORU Graduate School of Engineering Professor,HIGO YOUSUKE

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The objectives of this course are to understand the basics of geomechanics, and the advanced theories.

[Course schedule and contents]

Deformation of geomaterils (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 contiuum, stress-strain ralations 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 mode, 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)

[Course requirements]

Soil mechanics, Fundamentals of continuum mechanics

Continue to 地盤力学(2)↓↓↓

地盤力学(2)

[Evaluation methods and policy]

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

[Textbooks]

Handout will be given.
Soil mechanics, Fusao Oka, Asakura Publishing (in Japaneses)

[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.

未更新

Course number	G-ENG02 5F053 LJ55　G-ENG01 5F053 LJ55		
Course title (and course title in English)	応用数理解析 Applied Mathematics in Civil & Earth Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUKADA KAZUHIKO Graduate School of Engineering Associate Professor,SAITOU JIYUN

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The goal is to acquire a systematic understanding of fundamental theory of the data analysis.

[Course schedule and contents]

Liner problems and Generalized inverses, 5 times,
Inverse problems, solution of linear inverse problems, generalized inverse, Application of vector space and singular-value decomposition

Maximum likelihood methods, Continuous inverse problems, 4 times,
Maximum likelihood Applied to inverse problem, nonlinear problems, Continuous inverse problems

Application of data analysis, 5 times
Application of data analysis to Engineering problems

Achievement confirmation, 1 time
Comprehension check of course contents.

[Course requirements]

Fundamental knowledge of linear algebra and probabilistic analysis

[Evaluation methods and policy]

Evaluation is based on reports and the final examination.

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.

未更新

Course number	G-ENG01 7F065 LE73　G-ENG02 7F065 LE73		
Course title (and course title in English)	水域社会基盤学 Hydraulic Engineering for Infrastructure Development and Management	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,TODA KEIICHI Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA Graduate School of Global Environmental Studies 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

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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,Introduction of flood disasters during a few decades in the world, flood control planning in Japan, Economic evaluation and analysis of peoplersquos awareness to river improvement projects with dam construction.
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.

Continue to 水域社会基盤学(2)↓↓↓

水域社会基盤学(2)

Numerical simulation for Hydraulic engineering,1time,Recent numerical simulation development and related state-of-the-art technologies are overviewed.
Achievement Confirmation,1time,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.

Course number	G-ENG02 5F067 LE73　G-ENG01 5F067 LE73		
Course title (and course title in English)	構造安定論 Structural Stability	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

Course number	G-ENG01 6F068 LE73　G-ENG02 6F068 LE73		
Course title (and course title in English)	材料・構造マネジメント論 Material and Structural System & Management	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Engineering Associate Professor,AN RIN Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Understanding the maintenance targeting individual structure and asset management for targeting structures.

[Course schedule and contents]

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.

Course number	G-ENG01 6F071 LJ77		
Course title (and course title in English)	応用弾性学 Applied Elasticity for Rock Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Engineering Associate Professor,MURATA SUMIHIKO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

未更新

Course number	G-ENG01 5F073 LJ77		
Course title (and course title in English)	物理探査の基礎数理 Fundamental Theories in Geophysical Exploration	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MIKADA HITOSHI Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,XU Shibo

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

Students should understand exploration geophysics of undergraduate level.

[Evaluation methods and policy]

Rating is performed by the combination of exams (40%) and the attendance to the class (60%).

[Textbooks]

Specified in the course.

[References, etc.]

（Reference books）

Claerbout, J.F. (1976): Fundamentals of Geophysical Data Processing (Available online URL: http://sep.

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.

未更新

Course number	G-ENG01 5F075 LJ73　G-ENG02 5F075 LJ73		
Course title (and course title in English)	水理乱流力学 Hydrodynamics and Turbulence Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,TODA KEIICHI Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Engineering Assistant Professor,OKAMOTO TAKAAKI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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

[Course requirements]

Hydraulics

[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.

Course number	G-ENG01 7F077 LJ73　G-ENG02 7F077 LJ73		
Course title (and course title in English)	流域治水砂防学 River basin management of flood and sediment	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,SUMI TETSUYA Disaster Prevention Research Institute Associate Professor,KAWAIKE KENJI Disaster Prevention Research Institute Associate Professor,TAKEBAYASHI HIROSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

河川流域では、源頭部から河口部までにおいて、土石流・地すべり・洪水氾濫・内水氾濫・高潮などのあらゆる水災害・土砂災害が発生する。それらの災害について、国内外での事例、発生メカニズム、予測のための理論と方法、防止・軽減対策、ならびに流砂系の総合土砂管理やダム貯水池の土砂管理方策について述べる。

[Course objectives]

流域という単位で発生する現象について理解し、水災害および土砂災害に関する問題点や対策について見識を深めることを目標とする。

[Course schedule and contents]

豪雨災害対策について(2回)
近年の豪雨災害の発生と特徴、ダムによる洪水調節と異常洪水への対応などについて事例紹介とともに詳述する。

貯水池土砂管理について(3回)
ダムの長寿命化および流砂系の総合土砂管理の観点に着目した貯水池土砂管理について、世界的な動向、日本の先進事例を交えて詳述する。

流域治水について(4回)
河川の流域で発生する水害とその対策について、日本の治水史をたどりながら詳述する。

流域土砂動態について(5回)
流域土砂動態の解析方法について、最新の研究事例およびIRICを用いた演習を交えながら詳述する。

15回目は評価のフィードバック。

[Course requirements]

水理学、河川工学の基礎知識を習得していることが望ましい。

Continue to 流域治水砂防学 (2)↓↓↓

流域治水砂防学 (2)

[Evaluation methods and policy]

３名全員が出す課題の中から２課題を選択してレポートを提出。レポート点を７割、平常点を３割として、総合成績を判断する。

[Textbooks]

必要に応じて研究論文等を配布する。

[References, etc.]

（Reference books）
ダム工学会 『ダムの科学（改訂版）』（SBクリエイティブ, 2019）ISBN:978-4-7973-9708-6（ダムの歴史、洪水調節操作の基本、環境対策、新技術などを図解で解説）
池田駿介・小松利光・角　哲也 『流水型ダム－防災と環境の調和に向けて－』（技報堂，2017）ISBN:978-4-7655-1847-5（洪水調節に特化した流水型ダムの歴史，環境，土砂動態，具体事例などを解説）
国土文化研究所 『気候変動下の水・土砂災害適応策－社会実装に向けて－』（近代科学社，2016）ISBN:978-4-7649-0530-6（気候変動適応策の基本的考え方，国内外の具体的事例の解説）
気候変動による水害研究会 『水害列島日本の挑戦－ウィズコロナの時代の地球温暖化への処方箋－』（日経BP，2020）ISBN:978-4-296-10753-7（ウィズコロナ時代の地球温暖化適応策について図解で解説）

[Study outside of class (preparation and review)]

配布されたテキストを予習しておくことが望ましい。

（Other information (office hours, etc.)）

隔年開講科目、令和3年度は開講。
開講年にあっては各回とも出席を確認する。

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG01 5F078 LJ73　G-ENG02 5F078 LJ73

Course title (and course title in English)	岩盤応力と地殻物性 Rock stress and physical properties	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA Part-time Lecturer,YAMAMOTO KOJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 geoengineering and geoscience research areas.

[Course objectives]

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.

[Course schedule and contents]

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.

Continue to 岩盤応力と地殻物性 (2)↓↓↓

岩盤応力と地殻物性 (2)

[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.

Course number	G-ENG01 7F085 LE77　G-ENG02 7F085 LE77		
Course title (and course title in English)	地殻環境計測 Measurement in the earth's crust environment	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Engineering Associate Professor,NARA YOSHITAKA Part-time Lecturer,YAMAMOTO KOJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

・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.

・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.

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

Continue to 地殻環境計測(2)↓↓↓

地殻環境計測(2)

・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.

未更新

Course number	G-ENG01 6F088 LE77　G-ENG02 6F088 LE77		
Course title (and course title in English)	地球資源学 Earth Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

Securance and development harmonious with natural environments of the mineral and fossil energy resources, and utilization of storage function of geologic strata have become important issues for constructing sustainable society. This subject introduces comprehensively the present situation of uses of mineral and energy resources, crust structure and dynamics, economic geology for the genesis and geologic environments of deposits, physical and chemical exploration methods of marine deposits, mathematical geology for reserve assessment, engineering geology for resource development and geological repository, and problems and promise of natural energy such as geothermal, solar, wind, and tide.

[Course objectives]

To find out directionality about the technologies required for constructing sustainable society by yourself with full understandings of genetic mechanism, biased distribution, and the present situation of demand and supply of the mineral and energy resources.

[Course schedule and contents]

Introduction of this course and resources(1)
Definition of renewable and non-renewable resources. Interaction among Earth environment, human society, and natural resources. Existence pattern of natural resources in the crust.

1. Internal structure of Earth and geodynamics(2)
Inner structure of the Earth, geodynamics, geologic composition, temperature structure, rock physics, and chemical composition of crust.

2. Present and future of energy resources(1)
Classification of energy sources, recent trend on social demand of energy, physical characteristics of each energy resources, and sustainability.

3. Present and future of mineral resources(1)
Classification of minerals used for resources, recent trend on social demand of mineral resources, industrial uses of each mineral, and sustainability.

4. Economic geology (1)(1)
Classification of ore deposits, distribution of each type of ore deposit, generation mechanism of deposit.

4. Economic geology (2)(1)
General structure and distribution of fuel deposits (coal, petroleum, and natural gas), generation mechanism of deposits, and geological process of formation.

Continue to 地球資源学 (2)↓↓↓

地球資源学 (2)

5. Resource exploration (1): Terrestrial area(1)
Physical and chemical exploration technologies for natural resources in terrestrial area. Representative methods are remote sensing, electric sounding, electromagnetic survey, and seismic prospecting.

6. Resource exploration (2): Sea area(1)
Introduction of marine natural resources such as methane hydrate, cobalt-rich crust, and manganese nodule, and exploration technologies for the deposits in sea area.

7. Assessment of ore reserves and deposit characterization(2)
Fundamentals of geostatistics, variography for spatial correlation structure, spatial modeling by kriging, geostatistical simulation, integration of hard and soft data, and feasibility study.

8. Resource development(1)
Development and management technologies of energy resources related to coal, petroleum, and natural gas.

9. Engineering geology(1)
Fundamentals of deep geological repository for high-level nuclear waste, CCS (carbon dioxide capture and storage), and underground storage of petroleum and gas.

10. Sustainability(1)
Characteristics of natural energy related to geothermal, solar, wind, and tide, aand ssessment of natural energy resources. Co-existence of natural resource development with environment, low-carbon society, and problems for human sustainability.

Feedback(1)
Based on evaluation of the reports, contents that are not well understood will be explained additionally using KLUSIS or by personal interview.

[Course requirements]

Elementary knowledge of engineering, mathematics, physics, and geology are required.

[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]

Prints will be distributed during each class.

[References, etc.]

（Reference books）

Introduced during class

Continue to 地球資源学 (3)↓↓↓

地球資源学 (3)

[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.This class is opened every two years, and opened in 2019.

*Please visit KULASIS to find out about office hours.

Course number	G-ENG01 5F089 LJ73　G-ENG02 5F089 LJ73		
Course title (and course title in English)	社会基盤安全工学 Infrastructure Safety Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIYAMA TOMOYASU Graduate School of Engineering Assistant Professor,YASUDA NAOTOSHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To understand the basic technologies to enhance the safety of structures and also the fundamentals on disaster prevention.

[Course schedule and contents]

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.

Course number	G-ENG01 7F100 LE73　G-ENG02 7F100 LE73		
Course title (and course title in English)	応用水文学 Applied Hydrology	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,HORI TOMOHARU Disaster Prevention Research Institute Professor,SUMI TETSUYA Disaster Prevention Research Institute Professor,TANAKA SHIGENOBU Disaster Prevention Research Institute Associate Professor,TAKEMON YASUHIRO Disaster Prevention Research Institute Associate Professor,TANAKA KENJI Disaster Prevention Research Institute Associate Professor,Sameh Kantoush

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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 lecturesrsquo description and also investigation and discussion among the students.

[Course objectives]

To obtain fundamental Knowledge and skills to perform problem definition, survey amd countermeasure design on problems about water use, water hazard mitigation and water environment.

[Course schedule and contents]

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 Frequency Analysis
Basic theory and application of Hydrological Frequency Analysis, which is the basis for hydrologic design.

The 8th - 9th Classes: Land Surface Proceses
Modelling of land surface processes, Application of land surface model

The 10th - 11th Classes: Hydrological Measurements of Large River Basins
Design and management of hydrological measurement system in large river basins

The 12th - 13th Classes: Hydro-eco Systems,2times,

Continue to 応用水文学(2)↓↓↓

応用水文学(2)

Ecohydrological management of habitats in river ecosystems, Ecohydrological management of biodiversity in wetland ecosystems

The 14th - 15th Classes: Survey and Excersize
study and exercise for given topics

[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.

未更新

Course number	G-ENG01 6F103 LE73		
Course title (and course title in English)	環境防災生存科学 Case Studies Harmonizing Disaster Management and Environment Conservation	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,NAKAKITA EIICHI Disaster Prevention Research Institute Professor,MORI NOBUHITO 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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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,

[Course requirements]

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

Continue to 環境防災生存科学(2)↓↓↓

環境防災生存科学(2)

[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.

Course number	G-ENG01 5F106 LE16　G-ENG02 5F106 LE16		
Course title (and course title in English)	流域管理工学 Integrated Disasters and Resources Management in Watersheds	Instructor's name, job title, and department of affiliation	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 Associate Professor,KAWAIKE KENJI Disaster Prevention Research Institute Associate Professor,TAKEBAYASHI HIROSHI Disaster Prevention Research Institute Associate Professor,BABA YASUYUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Introduction,1time,Contents of this lecture are explaned.
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.
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.
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.
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.
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.
Evaluation of proficiency level, 1 times,Students confirm the proficiency level in this lecture.

[Course requirements]

Hydraulics, River Engineering, Coastal Engineering, Sediment Transport Hydraulics

Continue to 流域管理工学(2)↓↓↓

流域管理工学(2)

[Evaluation methods and policy]

Evaluation will be based on active participation (10 points), assignments (6 lecturers,15points 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.

Course number	G-ENG01 6F109 LE73　G-ENG02 6F109 LE73		
Course title (and course title in English)	地盤防災工学 Disaster Prevention through Geotechnics	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Disaster Prevention Research Institute Assistant Professor,UEDA KYOHEI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Week 1: Introduction
- Introduction to the course (objectives, contents, and grading procedure)
- Geo-hazards induced by heavy rain and earthquake
- Application of numerical analysis to predict the geo-hazards

Week 2-4: Nonlinear continuum mechanics 1
- Vector and tensor algebra
- Kinematics (motion and strain tensors)
- Concept of stress tensors

Week 5-7: Nonlinear continuum mechanics 2
- Balance Principles
- Objectivity and stress/strain rates
- Constitutive laws

Week 8-10: Fundamentals of dynamic three-phase analysis for geo-hazards
- Porous media theory
- Balance laws and constitutive equations
- Numerical method

Week 11-13: Soil dynamics and unsaturated soil mechanics
- In-situ survey, laboratory tests
- Cyclic deformation and strength properties of saturated soil
- Deformation and strength properties of unsaturated soil

Week 14-15: Applications of numerical analysis for geo-hazards
- Liquefaction

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.

Course number	G-ENG01 6F113 LE95		
Course title (and course title in English)	グローバル生存学 Global Survivability Studies	Instructor's name, job title, and department of affiliation	Graduate School of Advanced Integrated Studies in Human Survivability Professor,TAKARA KAORU Graduate School of Engineering Professor,KIYONO JIYUNJI Graduate School of Engineering Professor,FUJII SATOSHI Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Graduate School of Advanced Integrated Studies in Human Survivability Program-Specific Associate Professor,SHIMIZU MIKA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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 studentrsquos ability to express his/her own ideas and discuss with professors and students from other study areas.

[Course schedule and contents]

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.

Course number	G-ENG02 7F201 LB58　G-ENG01 7F201 LB58

Course title (and course title in English)	都市社会情報論 Information Technology for Urban Society	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

to understand the way of maintenance, operation and management of urban systems in the advanced informational and knowledge-intensive society.

[Course schedule and contents]

Outline,1time
Series of lectures on a topic given by different professors,13times
Summary and feedback,1time,

[Course requirements]

None

[Evaluation methods and policy]

Evaluation by four papers (Details will be provided in the first lecture)

[Textbooks]

Not used

[References, etc.]

（Reference books）

None

[Study outside of class (preparation and review)]

Details will be provided in the first lecture.

（Other information (office hours, etc.)）

Details will be provided in the first lecture.

*Please visit KULASIS to find out about office hours.

Course number	G-ENG01 5F203 LE73　G-ENG02 5F203 LE73				
Course title (and course title in English)	公共財政論 Public Finance		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUSHIMA KAKUYA	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Understanding the budget of the central government or municipalities and the public finance of its execution

[Course schedule and contents]

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.

未更新

Course number	G-ENG02 5F207 LJ73　G-ENG01 5F207 LJ73		
Course title (and course title in English)	都市社会環境論 Urban Environmental Policy	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI Graduate School of Management Associate Professor,OOBA TETSUHARU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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

[Course schedule and contents]

Outline,1time

Structure of urban problems,3times
Expansion of urban areas, Increase of Environmental impact, Making compact cities

Basic theory of transportation and environment,2times
Downtown activation, Road space re-allocation, Pedestrianisation

Road traffic and Public transportation,2times
Characteristics of traffic modes, Light Rail Transit, Bus Rapid Transit, Mobility Management

Fundamental theory for measurements of environmental values,3times
Utility, Equivalent Surplus, Compensating Surplus

Methodology to measure environmental values,3times
Travel Cost Method, Hedonic Approach, Contingent Valuation Method, Conjoint Analysis

Summary and feedback,1time,

[Course requirements]

basic knowledge of public economics is required

Continue to 都市社会環境論(2)↓↓↓

都市社会環境論(2)

[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.

未更新

Course number	G-ENG02 6F215 LJ73　G-ENG01 6F215 LJ73		
Course title (and course title in English)	交通情報工学 Intelligent Transportation Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,UNO NOBUHIRO Graduate School of Management Professor,YAMADA TADASHI Graduate School of Engineering Assistant Professor,NAKAO SATOSHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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).

[Course schedule and contents]

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,

[Course requirements]

None

[Evaluation methods and policy]

Final report: 45%, Mid-term report: 45% and Mark given for class participation: 10%

Continue to 交通情報工学(2)↓↓↓

交通情報工学(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.

未更新

Course number	G-ENG01 6F219 LJ34				
Course title (and course title in English)	人間行動学 Quantitative Methods for Behavioral Analysis	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUJII SATOSHI		
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,3times,
,3times,
,3times,
,3times,
,1time,

[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.

未更新

Course number	G-ENG01 5F223 LE24				
Course title (and course title in English)	リスクマネジメント論 Risk Management	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,Cruz Ana Maria Disaster Prevention Research Institute Associate Professor,YOKOMATSU MUNETA		
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Basic framework of risk management,2times,1-1 Representative concept of risk1-2 Risk management technologies
Decision making theory under risks,3times,2-1 The Bayes#039 theorem2-2 The Expected utility theory
Financial engineering,6times,3-1 The Capital Asset Pricing Model3-2 Option pricing theory3-3 The arbitrage theorem3-4 The Black-Scholes formula
Decision making methods for projects,3times,4-1 The decision tree analysis4-2 The real option approach
Comprehension check,1time,5 Comprehension check

[Course requirements]

Fundamental understanding of probability

[Evaluation methods and policy]

20% of score is valuated on attendance and discussion in classes, and 80% on reports.

[Textbooks]

[References, etc.]

（Reference books）

1.Ross, S.M.: An Elementary Introduction To Mathematical Finance, Cambridge University Press, 19992. Sullivan W.G.: Engineering Economy, Pearson, 2012

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG01 5F227 LJ73　G-ENG02 5F227 LJ73		
Course title (and course title in English)	構造ダイナミクス Structural Dynamics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Disaster Prevention Research Institute Professor,IGARASHI AKIRA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

(1) To aquire 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

[Course schedule and contents]

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.

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.

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.

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.

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.

Continue to 構造ダイナミクス(2)↓↓↓

構造ダイナミクス(2)

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.

Course number	G-ENG01 7F241 LJ73　G-ENG02 7F241 LJ73		
Course title (and course title in English)	ジオコンストラクション Construction of Geotechnical Infrastructures	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KIMURA MAKOTO Graduate School of Engineering Professor,KISHIDA KIYOSHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To learn to the advanced construction technology and to propose the project and design through the advanced construction technology.

[Course schedule and contents]

Guidance, Introduction of construction of geotechnical infrastructures,1time,Guidance, Introduction of construction of geotechnical infrastructures
Geo-investigation and survey techniques,2times,Introduction of the advanced geo-infestation and survey techniques. Explanation of inversion theory and technique.
Auxiliary mthods of mountain tunnel,2times,Introduction of NATM for construction of tunnel and underground cavern. In addition, the role of auxiliary methods, auxiliary method for safety in tunnel constrcution, axiliary methods for preservation of the surrounding environment are explained
Rock physics and its applications,2times,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.
Field visit or special lecture,1time,Visit the construction field or invite special lecture who is the expert engieer on the construction of geotechnical infrastructures.
Foundation,2times,Design and construction of piles foundation and steel pipe sheet piles
Culvert,2times,Design and construction of box type and arch type culverts
Retaining wall,2times,Design and construction of retaining wall
Examination of understanding,1time,

[Course requirements]

Soil mechanics, Rock mechanics

[Evaluation methods and policy]

Attendance and Report (20 %), Examination (80 %)

[Textbooks]

Not used

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)

[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.

未更新

Course number	G-ENG02 8F251 PB58　G-ENG01 8F251 PB58		
Course title (and course title in English)	自主企画プロジェクト Exercise on Project Planning	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

Goals are cultivating ability for self-initiative, planning and creativity.

[Course schedule and contents]

Course introduction,1time,
Proposal of project,6times,
Management of project,12times,
Progress report,1time,
Final report,8times,
Presentation,2times,

[Course requirements]

None

[Evaluation methods and policy]

Planning, implementation of project and reports are comprehensively evaluated.

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Details are provided in the first lecture.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG01 5F261 LE73　G-ENG02 5F261 LE73		
Course title (and course title in English)	地震・ライフライン工学 Earthquake Engineering/Lifeline Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KIYONO JIYUNJI Disaster Prevention Research Institute Professor,IGARASHI AKIRA Graduate School of Engineering Associate Professor,FURUKAWA AIKO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,2times,
,1time,
,1time,
,1time,
Principles of seismic design of structures,2times,Fundamental thories on dynamic response of nonlinear elastoplastic structural systems and representative seismic design principles
Seismic performance of concrete and steel structures,1time,Essentials and current issues related to seismic performance and design of RC and steel structures
Seismic response control and seismic retrofit of structures,1time,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
,1time,
,2times,
,1time,
,1time,
Achievement evaluation,1time,Students#039 achievements in understanding of the course material are evaluated.

[Course requirements]

None

Continue to 地震・ライフライン工学(2)↓↓↓

地震・ライフライン工学(2)

[Evaluation methods and policy]

[Textbooks]

Not specified

[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.

Course number	G-ENG01 7F263 LJ73　G-ENG02 7F263 LJ73		
Course title (and course title in English)	サイスミックシミュレーション Seismic Engineering Exercise	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,SAWADA SUMIO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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)

[Course schedule and contents]

1. Frequency domain analysis
 Basics of Fourier transformation is introduced.

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.

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.

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.

8-9. Seismic analysis method of soil
 Seismic analysis method of layered half-space based on equivalent linearization method is introduced.

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.

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.

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.

未更新

Course number	G-ENG02 6F267 LJ73　G-ENG01 6F267 LJ73		
Course title (and course title in English)	水文気象防災学 Hydro-meteorologically based Disaster Prevention	Instructor's name, job title, and department of affiliation	Graduate School of Advanced Integrated Studies in Human Survivability Professor,TAKARA KAORU Disaster Prevention Research Institute Professor,NAKAKITA EIICHI Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Technical theories of designing and real-time predictions, which combine hydrology and meteorology, as well as water planning and management theory will be covered based on climate change, as well as changes in water circulation and water environments associated with urbanization, and the impact of these on people and society, as well as disasters. Not only the physical factors but also the probability statistics approach will be covered, while using weather radars and satellite remote sensing information, on a scale from the global to the city level.

[Course objectives]

Learning about the technical theories of planning prediction and real-time prediction, which combine hydrology and meteorology, as well as basin water planning and management theory will be covered based on climate change as well as changes in water circulation and water environments associated with urbanization and the impact of these on people and society and disasters.

[Course schedule and contents]

"Observation and prediction of rainfall by radar (2 times)
Up-to-date information on rainfall observations with advanced weather radars and satellite-mounted radars will be provided, as well as rainfall estimation and rainfall prediction.
World heavy rain disasters, people/society and global warming (2 times)
Consideration of the impact of heavy rain disasters on people and society, taking as examples the flood disasters that have occurred abroad. In addition, consideration will be given to how it is thought that global warming affects how rain falls, how to confirm this scientifically, how to carry out flood control planning, and what countermeasures to take.

Hydrometeorological disasters and prevention (1 time)
Recent cases of hydrometeorological disasters that have occurred both in Japan and abroad are introduced, and their characteristics are clarified. Additionally, a lecture will be given on techniques, policies, and legal systems for the prevention of disasters.

Hydrologic frequency analysis (2 times)
A method to calculate the frequency of extreme events by the probabilistic statistical analysis of data on hydrological extreme values, such as the greatest torrential rainfall and flood of the year, will be presented. Using the actual data series on extreme values, various probability distributions will be applied, their fitness will be evaluated, and the T annual probable hydrological value and its estimation accuracy will be obtained.

Continue to 水文気象防災学 (2)↓↓↓

水文気象防災学 (2)

Hydrological and water quality analysis of urban rivers (2 times)
The explanation, analysis, and evaluation method of the rainfall outflow system in urban river basins (natural) and water and substance outflow phenomena in water supply/sewerage systems (artificial) will be discussed. In particular, the outflow phenomenon from the non-point pollution source and the impact on the river environment will be described.

Flood control in urban areas and water environmental management (2 times)
Sewerage for urban flood control and the suppression effect of various facilities for the suppression of the accompanying overflow as well as the actual situation of rainwater use will be introduced. In particular, the necessity of real-time control of sewage pumping stations and storage facilities, and their effects and limitations, will be described.

Operation of flood control dams and their effect (1 time)
Dams are a powerful method for controlling floods. Practical examples of the operation method of flood control dams and the operation of dams at the time of floods in recent years will be introduced, and improvements in the degree of safety by flood control dams will also be considered. Additionally, the possibility of further improving the effect by using a flexible operation method combined with weather forecasting will be covered.

Transmission of hydrometeorological information and flood hazard map (1 time)
Hydrometeorological information is transmitted using various media. The information route and communication method from observation to actual evacuation/flood control activities will be introduced. Thorough consideration will be given to the ideal state of an effective disaster prevention information system.

Test (1 time)

[Course requirements]

Basic knowledge on hydrology and water engineering

[Evaluation methods and policy]

The results will be evaluated by combining regular tests and points given for class participation.

[Textbooks]

Not in particular.

[References, etc.]

（Reference books）
Not in particular.

Continue to 水文気象防災学 (3)↓↓↓

水文気象防災学 (3)

[Study outside of class (preparation and review)]

Review of basic knowledge on hydrology and water engineering

（Other information (office hours, etc.)）

The course is opened every other year. It will be opened in 2019.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG01 7F380 LE77

Course title (and course title in English)	強靭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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Associate Professor,MATSUSHIMA KAKUYA Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,SUSAKI JIYUNICHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester

Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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,

[Course requirements]

None

[Evaluation methods and policy]

40% for course work assignments and reports, 60% for final exam.

Continue to 強靭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.

未更新

Course number	G-ENG01 7F382 LE73		
Course title (and course title in English)	安寧の都市のための災害及び健康リスクマネジメント Disaster and Health Risk Management for Liveable City	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Associate Professor,MATSUSHIMA KAKUYA Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,SUSAKI JIYUNICHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

Various types of disasters constantly attack to Asian countries, and those countries sometimes are very vulnerable to the natural disasters and health risk. The interdisciplinary approach of engineering and medical science is indispensable to construct disaster-resilient countries. The 2011 Tohoku earthquake was one of the worst disasters in recent Japanese history. However many lessons to mitigate and manage the disaster are learnt from the event. In order to solve the related issues, the course provides selected topics about natural disaster, disaster-induced human casualty, emergency response, urban search and rescue, emergency medical service, principle of behavior based on neuroscience, urban search and rescue, reconstruction and rehabilitation policy, social impact of disaster, transportation management, logistics during earthquake disaster and so on.

[Course objectives]

Course aims to foster international leaders who are able to solve and manage problems concerned about natural disaster, disaster mitigation, health and environmental issues, logistics and amenity for constructing liveable city.

[Course schedule and contents]

Guidance and Group Work,2times,
ORT,3times,
Earthquake disaster and human casualty,1time,
Earthquake protection and emergency responses,1time,
Human brain function and behavior,1time,
Disaster medicine and epidemiology,1time,
Resilient society,1time,
Transition of the design for amenity in the river-front,1time,
Concern that elderly people in rural area have over health and mobility,1time,
Differences in logistics and humanitarian logistics,1time,
Unique challenges of humanitarian logistics,1time,
Advancement on humanitarian logistics,1time,
Achievement evaluation,1time,

Continue to 安寧の都市のための災害及び健康リスクマネジメント(2)↓↓↓

安寧の都市のための災害及び健康リスクマネジメント(2)

[Course requirements]

No special knowledge and techniques are necessary.

[Evaluation methods and policy]

Course work assignments and reports

[Textbooks]

Textbook for the course is provided by the instructor on the first day.

[References, etc.]

（Reference books）

Some literatures would be introduced by professors.

（Related URLs）

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

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Contact person: Prof.Kiyono ltkiyono@quake.kuciv.kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

Course number	G-ENG01 6F405 LE73　G-ENG02 6F405 LE73		
Course title (and course title in English)	ジオフロント工学原論 Fundamental Geofront Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MIMURA MAMORU Graduate School of Engineering Professor,HIGO YOUSUKE Graduate School of Engineering Professor,KIMURA MAKOTO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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

[Course schedule and contents]

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)↓↓↓

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.

[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.

Course number	G-ENG02 5F415 LJ73　G-ENG01 5F415 LJ73

Course title (and course title in English)	環境材料設計学 Ecomaterial Design	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI

Target year		Number of credits	2	Year/semesters	2021/First semester

Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Lecture on outline of impact of construntion 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.

[Course objectives]

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.

[Course schedule and contents]

Guidance,1time,Object of the Course, Grading and Goals
product of materials and impact to environment,1time,Product of cement, steel, concrete CO2 product and its influence
recycle and reuse of materials,3times,Recycle and reuse of steel, metals, concrete, asphalt, plastics
Technology development of construction materials
deterioration of concrete structures,1time,Mechanism of deterioration of concrete structures: carbonation, salt attack, alkali-aggregate reaction Maintenance and retrofit methods
deterioration of steel structures,1time,Mechanism of deterioration of steel structures: corrosion, fatigue
Maintenance and retrofit methods
deterioration of composite structures,1time,Mechanism of deterioration of composite structures: Maintenance and retrofit methods
life-cycle assessment of structures,1time,Life-cycle assessment of structures considering initial cost as well as maintenance cost
topics and discussion,2times,Recent topics on construction materials and discussion
presentation by students and discussion / feedback,4times,Presentation by students on the individual topics
Discussion on the topics. Feedback at the last class

[Course requirements]

Basic knowledge of construction materials, concrete engineering

[Evaluation methods and policy]

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

Continue to 環境材料設計学(2)↓↓↓

環境材料設計学(2)

[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 discusions are welcome

*Please visit KULASIS to find out about office hours.

Course number	G-ENG02 6F462 LE73　G-ENG01 6F462 LE73		
Course title (and course title in English)	海岸波動論 Coastal Wave Dynamics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Global Environmental Studies Associate Professor,HARADA EIJI Graduate School of Engineering Assistant Professor,IKARI HIROYUKI Graduate School of Engineering Assistant Professor,Yuma Shimizu

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

Wave motion, which is the main driving force in coastal zone, is explained focusing on wave transformation theory and computational fluid dynamics, and design for coastal structures of their engineering applications is illustrated. As for the computational fluid dynamics for waves, methodology of free-surface wave based on the Navier-Stokes equation, which has been significantly developed in recent years, is explained in detail.

[Course objectives]

Goal of this course is a detailed understanding of fundamental of wave transformation theory and computational fluid dynamics related to wave motion, and is also acquiring a design concept for coastal structures as their engineering applications.

[Course schedule and contents]

Introduction:
The purpose and constitution of the lecture the method of the scholastic evaluation are explained.(1)

Conservation laws of fluid:
Fundamentals of fluid mechanics, liner / non-liner wave theories and numerical mathematics are explained.(4)

Modeling of surf zone dynamics:
Several methodologies against free-surface wave including breaking waves (i.e. VOF, MPS, SPH) are illustrated. Especially advanced approaches of MPS and SPH are explained in detail.(6)

Introduction of turbulence models:
Reynolds averaging models and large eddy simulation are outlined.(1)

Modeling of rock mound dynamics:
Method for tracking of armor blocks under high waves using Distinct Element Method is described.(2)

Achievement Confirmation:
Comprehension check of course contents.(1)

Continue to 海岸波動論(2)↓↓↓

海岸波動論(2)

[Course requirements]

Non. It is desiarable to have knowledge about hydraulics, fluid mechanics.

[Evaluation methods and policy]

Grading is based on student ’ s activities in lectures and written examination.

[Textbooks]

Computational Wave Dynamics by Hitoshi Gotoh, Akio Okayasu and Yasunori Watanabe 234pp, ISBN: 978-981-4449-70-0

[References, etc.]

（Reference books）

non

[Study outside of class (preparation and review)]

The review after the class is necessary.

（Other information (office hours, etc.)）

If there are any questions, please send e-mail to the staff. This course will be offered in 2019.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG02 7F464 LJ73　G-ENG01 7F464 LJ73		
Course title (and course title in English)	水工計画学 Hydrologic Design and Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 determone 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.

[Course objectives]

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.

[Course schedule and contents]

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.

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.

Course number	G-ENG02 6K016 LE73　G-ENG01 6K016 LE73		
Course title (and course title in English)	計算地盤工学 Computational Geotechnics	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Graduate School of Management Associate Professor,KIMOTO SAYURI Graduate School of Engineering Associate Professor,SAWAMURA YASUO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Understanding the numerical modeling of multiphase geomaterials

[Course schedule and contents]

【Introduction】　(1time)
Guidance and introduction to computational geomechanics

【Governing equations】 (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.

【Numerical methods and applications】 (4 times)
Numerical methods (FEM, FDM etc.)
Applications of finite element method

【Exercises】 (3 times)
FEM analysis for two-phase mixture
Exercises and interpretations of the results
Presentation

[Course requirements]

Understanding on fundamental geomechanics

Continue to 計算地盤工学(2)↓↓↓

計算地盤工学(2)

[Evaluation methods and policy]

Reports

[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.

Course number	G-ENG01 5W001 LE73　G-ENG02 5W001 LE73		
Course title (and course title in English)	社会基盤構造工学 Structural Engineering for Civil Infrastructure	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

Structural engineering problems related to planning, design, construction and maintenance of the infrastructures are discussed. Topics concerning structural engineering and management are widelly taken up including latest advanced knowledge and technology, future view and/or international topics. Special lectures by extramural lecturers are carried out if necessary.

[Course objectives]

To grasp problems related to structural engineering and their specific solutions.
To understand applicability of advanced technologies and development prospects.

[Course schedule and contents]

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

[Course requirements]

Structural Mechanics, Wind Resistant Design, Construction Materials, Dynamics of Structures, etc.

[Evaluation methods and policy]

Coursework will be graded based on the reports.

[Textbooks]

The textbook is not required. Materials will be supplied by instructors.

[References, etc.]

（Reference books）

Supplemental text books will be introduced by instructors.

[Study outside of class (preparation and review)]

To review today's topics.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG01 7X311 LE77

Course title (and course title in English)	都市基盤マネジメント論 Urban Infrastructure Management	Instructor's name, job title, and department of affiliation	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 Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Professor,MIMURA MAMORU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

This lecture aims to provide interdisciplinary knowledge associated with how urban infrastructure is comprehensively management, from viewpoints of not only economy but also ldquohuman security engineeringrdquo. 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.

[Course objectives]

Aquisition of interdisciplinary knowledge associated with how urban infrastructure is comprehensively management, from viewpoint of not only economy but also human security engineering.

[Course schedule and contents]

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)

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.)）

Addtional 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.

未更新

Course number	G-ENG01 5X333 LE24				
Course title (and course title in English)	災害リスク管理論 Disaster Risk Management		Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,TATANO HIROKAZU Disaster Prevention Research Institute Associate Professor,YOKOMATSU MUNETA Disaster Prevention Research Institute Associate Professor,SAMADDAR，Subhajyoti	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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

[Course requirements]

Nothing

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) ldquoThe Financing of Catastrophic Riskrdquo, the University of Chicago Press Kunreuther H. and Rose, A., ldquoThe Economics of Natural Hazardsrdquo, Vol.1 amp 2, The International Library of Critical Writings in Economics 178, Edward Elgar publishers, 2004 Okuyama, Y., and Chang, S.T.,(eds.) ldquoModeling Spatial and Economic Impacts of Disastersrdquo (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.

未更新

Course number	G-ENG01 7F063 PJ58		
Course title (and course title in English)	社会基盤工学実習 Practice in Infrastructure Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

all,1time,study practical knowledge.
,5times,
,6times,
,3times,

[Course requirements]

None

[Evaluation methods and policy]

Attendance and reports are comprehensively evaluated.

[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.

未更新

Course number	G-ENG31 7U051 SE58		
Course title (and course title in English)	社会基盤工学総合セミナーA Integrated Seminar on Infrastructure Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Goals are to cultivate students' ability for discussing research topic in English.

[Course schedule and contents]

Guidance, 1 time,
Preparation for presentation, 2 times,
Presentation on research and discussion, 10 times,
Submission of presentation materials, 2 times.

[Course requirements]

None

[Evaluation methods and policy]

Evaluation for each student is made comprehensively based on presentation, discussion and participation in the classroom.

[Textbooks]

Not used

[References, etc.]

（Reference books）

None

[Study outside of class (preparation and review)]

Review the presentation contents in the seminar.

（Other information (office hours, etc.)）

Details will be provided in the guidance and first lecture.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG31 7U052 SE58		
Course title (and course title in English)	社会基盤工学総合セミナーＢ Integrated Seminar on Infrastructure Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Goals are to cultivate students' ability for discussing research topic in English.

[Course schedule and contents]

Guidance,1time,
Preparation for presentation,2times,
Presentation on research and discussion,10times,
Submission of presentation materials,2times,

[Course requirements]

None

[Evaluation methods and policy]

Evaluation for each student is made comprehensively based on presentation, discussion and attendance.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Review the presentation contents in the seminar.

（Other information (office hours, etc.)）

Details will be provided in the guidance and first lecture.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG01 7U055 PJ58		
Course title (and course title in English)	社会基盤工学セミナーA Seminar on Infrastructure Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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 datas, the way of doing the research and summarizing the results of research.

[Course objectives]

[Course schedule and contents]

,2times,
,6times,
,8times,
,6times,
,8times,

[Course requirements]

None

[Evaluation methods and policy]

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.

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.

1 point: Presentation at laboratory seminar (only if supervisor agrees), oral presentation in the annual meeting in the Society of Civil Engineers.

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.

3 point : Presentation in English in international conference. If the papers are peer-reviewed, the points are determined as journal papers (see below).

5〜10 point: Fist 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.)

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

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.

未更新

Course number	G-ENG01 7U056 PJ58		
Course title (and course title in English)	社会基盤工学セミナーB Seminar on Infrastructure Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

all,2times,Each supervisor navigates students thorough their presentations and discussion.
,6times,
,8times,
,6times,
,8times,

[Course requirements]

None

[Evaluation methods and policy]

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.
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.
1 point: Presentation at laboratory seminar (only if supervisor agrees), oral presentation in the annual meeting in the Society of Civil Engineers.
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.
3 point : Presentation in English in international conference. If the papers are peer-reviewed, the points are determined as journal papers (see below).
5〜10 point: Fist 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.)
Others: Exercise on project or training course (Number of points is determined by your supervisor). However,

Continue to 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.

未更新

Course number	G-ENG01 8U059 PJ58		
Course title (and course title in English)	社会基盤工学インターンシップ Internship on Infrastracture Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,,

[Course requirements]

None

[Evaluation methods and policy]

Writing plans, completing internship, final report and presentation are comprehensively evaluated.

[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.

未更新

Course number	G-ENG31 7U060 PB58		
Course title (and course title in English)	社会基盤工学ＯＲＴ ORT on Infrastructure Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,2times,
,6times,
,8times,
,6times,
,8times,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

Continue to 社会基盤工学ＯＲＴ(2)↓↓↓

社会基盤工学ＯＲＴ(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.

未更新

Course number	G-ENG31 7U064 PB58		
Course title (and course title in English)	社会基盤工学総合実習A Practice in Advanced Infrastructure Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,5times,
,2times,
,5times,

[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.

未更新

Course number	G-ENG31 7U065 PB58		
Course title (and course title in English)	社会基盤工学総合実習B Practice in Advanced Infrastructure Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,5times,
,2times,
,5times,

[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.

未更新

Course number	G-ENG02 8F150 PJ58		
Course title (and course title in English)	長期インターンシップ Long-Term Internship	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,15times,

[Course requirements]

None

[Evaluation methods and policy]

Writing plans, completing internship, final report and presentation are comprehensively evaluated.

[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.

未更新

Course number	G-ENG02 8F253 PJ58		
Course title (and course title in English)	キャップストーンプロジェクト Capstone Project	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

Goals are to cultivate students' ability for planning, creativity and communication.

[Course schedule and contents]

Guidance,1time,
Plan projects,4times,
Implement projects,6times,
Analyze and evaluate projects,12times,
Discuss results,6times,
Presentation,1time,

[Course requirements]

None

[Evaluation methods and policy]

Evaluation for each student is made comprehensively based on both report and presentation about the project, and usual contribution of student to the project.

[Textbooks]

Non

[References, etc.]

（Reference books）

Non

[Study outside of class (preparation and review)]

Examine the project theme.

（Other information (office hours, etc.)）

Details will be provided in the first lecture.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG02 7F257 SJ58		
Course title (and course title in English)	都市社会工学セミナーA Seminar on Urban Management A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,2times,
,6times,
,8times,
,6times,
,8times,

[Course requirements]

None

[Evaluation methods and policy]

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.
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.
1 point: Presentation at laboratory seminar (only if supervisor agrees), oral presentation in the annual meeting in the Society of Civil Engineers.
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.
3 point : Presentation in English in international conference. If the papers are peer-reviewed, the points are determined as journal papers (see below).
5〜10 point: Fist 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.)
Others: Exercise on project or training course (Number of points is determined by your supervisor). However,

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.

未更新

Course number	G-ENG02 7F259 SJ58		
Course title (and course title in English)	都市社会工学セミナーB Seminar on Urban Management B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,2times,
,6times,
,8times,
,6times,
,8times,

[Course requirements]

None

[Evaluation methods and policy]

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.
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.
1 point: Presentation at laboratory seminar (only if supervisor agrees), oral presentation in the annual meeting in the Society of Civil Engineers.
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.
3 point : Presentation in English in international conference. If the papers are peer-reviewed, the points are determined as journal papers (see below).
5〜10 point: Fist 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.)
Others: Exercise on project or training course (Number of points is determined by your supervisor). However,

Continue to 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.

未更新

Course number	G-ENG32 7U201 SE58		
Course title (and course title in English)	都市社会工学総合セミナーA Integrated Seminar on Urban Management A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Goals are to cultivate students' ability for discussing research topic in English.

[Course schedule and contents]

Guidance, 1 time,
Preparation for presentation, 2 times,
Presentation on research and discussion, 10 times,
Submission of presentation materials, 2 times.

[Course requirements]

None

[Evaluation methods and policy]

Evaluation for each student is made comprehensively based on presentation, discussion and participation in the classroom.

[Textbooks]

Not used

[References, etc.]

（Reference books）

None

[Study outside of class (preparation and review)]

Review the presentation contents in the seminar.

（Other information (office hours, etc.)）

Details will be provided in the guidance and first lecture.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG32 7U203 SE58				
Course title (and course title in English)	都市社会工学総合セミナーB Integrated Seminar on Urban Management B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN		
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Goals are to cultivate students' ability for discussing research topic in English.

[Course schedule and contents]

Guidance,1time,
Preparation for presentation,2times,
Presentation on research and discussion,10times,
Submission of presentation materials,2times,

[Course requirements]

None

[Evaluation methods and policy]

Evaluation for each student is made comprehensively based on presentation, discussion and attendance.

[Textbooks]

Not used

[References, etc.]

（Reference books）

None

[Study outside of class (preparation and review)]

Review the presentation contents in the seminar.

（Other information (office hours, etc.)）

Details will be provided in the guidance and first lecture.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG02 7U210 PJ58		
Course title (and course title in English)	都市社会工学実習 Practice in Urban Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

,,

[Course requirements]

None

[Evaluation methods and policy]

Attendance and reports are comprehensively evaluated.

[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.

未更新

Course number	G-ENG32 7U216 PB58		
Course title (and course title in English)	都市社会工学ORT ORT on Urban Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,2times,
,6times,
,8times,
,6times,
,8times,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

未更新

Course number	G-ENG32 7U224 PB58		
Course title (and course title in English)	都市社会工学総合実習A Practice in Advanced Urban Management A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,5times,
,2times,
,5times,

[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.

未更新

Course number	G-ENG32 7U225 PB58				
Course title (and course title in English)	都市社会工学総合実習B Practice in Advanced Urban Management B		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO	
Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,5times,
,2times,
,5times,

[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.

Course number	G-ENG03 5A622 LJ15		
Course title (and course title in English)	**地圏環境工学特論** Geohydro Environment Engineering, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YONEDA MINORU Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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)

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

Continue to 地圏環境工学特論(3)↓↓↓

地圏環境工学特論(3)

[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.

未更新

Course number	G-ENG03 5A626 LJ24

Course title (and course title in English)	環境衛生学特論 Environmental Health, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,TAKANO HIROHISA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Students learn about the fundamentals of environmental health and make use of the knowledge for the development of related areas.

[Course schedule and contents]

Environment and health,2times,Lecture on the relationships between environmental factors and our health
Seminar on the previous and recent environmental problems,13times,Presentation and discussion on the previous and recent environmental problems, with special emphasis on their relation with health concerns

[Course requirements]

None

[Evaluation methods and policy]

Points are allocated for the activities on the presentation and discussion.

[Textbooks]

Not used. To be introduced from time to time in the lecture.

[References, etc.]

（Reference books）

To be introduced during class. To be introduced from time to time in the lecture.

[Study outside of class (preparation and review)]

If knowledge of high school biology is insufficient, it might be considered desirable to review every time. No particular preparations are necessary.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG03 5A632 LB24		
Course title (and course title in English)	都市代謝工学 Urban Metabolism Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAOKA MASAKI Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

To understand technological measures by learning about current trend and issue of urban metabolism and related engineering principles.

[Course schedule and contents]

Class 1:Introduction (Takaoka)
Concept of urban metabolism and its system are explained.

Class 2-10: Elements of urban metabolic system (Takaoka: 7, Oshita: 3)
Planning and selection of urban metabolic system, Transportation & collection, Engineering principles on Recycling, Thermal recovery, Engineering principles on flue gas treatment and Landfill management are explained.

Class 11-12: Hazardous Waste Management(Takaoka :2)
Treatment, disposal and management of hazardous waste are explained.

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.

Class 15:Feedback(Takaoka and Oshita)
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]

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)

[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.

未更新

Course number	G-ENG03 5A643 LJ16		
Course title (and course title in English)	環境微生物学特論 Environmental Microbiology, Adv.	Instructor's name, job title, and department of affiliation	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 Program-Specific Assistant Professor,IHARA MASARU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To understand fundamental knowledge of microbiology, which can support environmental engineering.

To discuss current situation and challenges about application of microorganisms for solution of environmental problem, and study with practice.

[Course schedule and contents]

(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.

(2) Classification, Nomenclature, Cultivation, and Function of Microorganisms: [1 time]

(3) Microbial ecosystem structure and Microorganism community analysis by gene information: [2 times]

(4) Metabolism of microorganisms, and material transformation: [2 times]

(5) Mathematical model of microbial activity and numerical analysis by computer: [1 time]

(6) Environmental measurement and evaluation using microorganisms: [1 time]

(7) Waterborne diseases and microorganisms: [1 time]

(8) Phytoplankton growth and hazardous substances production: [1 time]

Continue to 環境微生物学特論(2)↓↓↓

環境微生物学特論(2)

(9) Presentation and Discussion of each research subject: [3 times]

(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.

未更新

Course number	G-ENG03 5F234 LB15		
Course title (and course title in English)	水質衛生工学 Water Sanitary Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ITOH SADAHIKO Graduate School of Global Environmental Studies Professor,ECHIGO SHINYA Graduate School of Engineering Assistant Professor,NAKANISHI TOMOHIRO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

To quantify chemical and microbial risk in drinking water and to realize methodologies of risk management and control.

[Course schedule and contents]

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.

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).

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.

Global burden of disease and its index (2 times; Nakanishi)
Disability-adjusted life years and its significance.

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.

Feedback and summary (1 time; All the professors)
Feedback of assignments and summary.

Continue to 水質衛生工学(2)↓↓↓

水質衛生工学(2)

[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.

Course number	G-ENG03 7F400 PJ16		
Course title (and course title in English)	都市環境工学セミナーA Seminar on Urban and Environmental Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To understand the overall picture of the issues related to urban environmental engineering and to summarize the master's research in original research paper.

[Course schedule and contents]

Issue 1 setting (1 time)
Set issue 1 on urban environmental engineering that each student studies.

Survey and progress report (1 time)
Each student conducts survey and research on selected task 1.

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.

Task 2 setting (1 time)
Set issue 2 on urban environmental engineering that each student studies.

Survey and progress report (1 time)
Each student conducts survey and research on selected task 2.

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.

Issue 3 setting (1 time)
Set issue 3 on urban environmental engineering to be studied by each student.

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.

Course number	G-ENG03 7F402 PJ16				
Course title (and course title in English)	都市環境工学セミナーB Seminar on Urban and Environmental Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI		
Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To understand the overall picture of the issues related to urban environmental engineering and to summarize the master's research in original research paper.

[Course schedule and contents]

Issue 1 setting (1 time)
Set issue 1 on urban environmental engineering that each student studies.

Survey and progress report (1 time)
Each student conducts survey and research on selected task 1.

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.

Task 2 setting (1 time)
Set issue 2 on urban environmental engineering that each student studies.

Survey and progress report (1 time)
Each student conducts survey and research on selected task 2.

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.

Issue 3 setting (1 time)
Set issue 3 on urban environmental engineering to be studied by each student.

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.

Course number	G-ENG03 5F439 LE24		
Course title (and course title in English)	環境リスク学 Environmental Risk	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

Paying attention to the environment of children in particular, students themselves study, make presentation, and debate about the environmental risk. Students learn the backgound, the actual situation, and the theory for quantitative risk analysis through practice of investigation and discusion by themselves.

[Course objectives]

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

[Course schedule and contents]

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

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

Innume 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

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.

未更新

Course number	G-ENG03 5F441 LJ16		
Course title (and course title in English)	水環境工学 Water Quality Control Engineering	Instructor's name, job title, and department of affiliation	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 Senior Lecturer,NAKADA NORIHIDE Graduate School of Engineering Assistant Professor,TAKEUCHI HARUKA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

・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.

・Water quality indexes and analysis(2 times)
Basic knowledge for Water quality indexes and their analysis including instrumental analysis are explained.

・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.

・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.

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.

未更新

Course number	G-ENG03 5F446 LB15		
Course title (and course title in English)	大気・地球環境工学特論 Atmospheric and Global Environmental Engineering, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FUJIMORI SHINICHIRO Graduate School of Engineering Assistant Professor,OSHIRO KEN

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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,

[Course requirements]

None

[Evaluation methods and policy]

Points are allocated for the quiz at every lectures, the presentation and discussion, report.

Continue to 大気・地球環境工学特論(2)↓↓↓

大気・地球環境工学特論(2)

[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.

Course number	G-ENG03 7F449 SJ16		
Course title (and course title in English)	都市環境工学演習A Laboratory and Seminar on Urban and Environmental Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To conduct the internship and obtain

[Course schedule and contents]

Internship content determination (2 times)
Select internships where each student participates.

Research / Research (10 times)
Through internships, you gain professional knowledge and experience.

Report creation (2 times)
Report on experience gained by internship and submit.

Presentation (1 time)
In response to the teachers in charge, we will announce the content of the report and ask questions and respond.

[Course requirements]

None

[Evaluation methods and policy]

The results will be evaluated comprehensively.

Continue to 都市環境工学演習A(2)↓↓↓

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.

Course number	G-ENG03 7F450 SJ16		
Course title (and course title in English)	都市環境工学演習Ｂ Laboratory and Seminar on Urban and Environmental Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To

[Course schedule and contents]

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.

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.

Course number	G-ENG03 5F454 LB24		
Course title (and course title in English)	循環型社会システム論 Systems Approach on Sound Material Cycles Society	Instructor's name, job title, and department of affiliation	Agency for Health, Safety and Environment Professor,HIRAI YASUHIRO Agency for Health, Safety and Environment Assistant Professor,YANO JUNYA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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:
1) History, current status, and the prospect of waste issues and establishing a sound material-cycles society.
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.
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.
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.

[Course objectives]

The goals of this class are as follows;
To understand the systems and technologies for the formation of a sound material-cycles society.
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.
To understand the concept of material flow analysis.
To be able to conduct a life cycle assessment.
To understand the basic concept of multi-media environmental fate model (Fugacity model) of chemical substances.
To understand the source, fate, and management of persistent organic pollutants (POPs).

[Course schedule and contents]

1. The Fundamental Law and Plan for Establishing a Sound Material-Cycles Society (Hirai)
2. Food Loss and Food Waste (Yano)
3. Packaging and Containers Waste (Yano)
4. Resource Circulation Strategy for Plastics (Yano)
5. End of Life Vehicles (Yano)
6. E-Waste (Hirai)
7. Material Flow Analysis and Life Cycle Thinking (Yano)
8. Data Reconciliation Method for MFA (Hirai)
9. Life-Cycle Assessment: Goal and Scope Definition (Hirai)
10. Life-Cycle Assessment: Inventory Analysis (Hirai)

Continue to 循環型社会システム論(2)↓↓↓

循環型社会システム論(2)

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.

Course number	G-ENG03 5F456 LE16				
Course title (and course title in English)	新環境工学特論I New Environmental Engineering I, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SHIMIZU YOSHIHISA Graduate School of Global Environmental Studies Professor,ECHIGO SHINYA Graduate School of Engineering Associate Professor,NISHIMURA FUMITAKE		
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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).

[Course objectives]

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.

[Course schedule and contents]

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: Challenngeis 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)

Continue to 新環境工学特論I(2)↓↓↓

新環境工学特論I(2)

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.

Course number	G-ENG03 5F458 LE16		
Course title (and course title in English)	新環境工学特論II New Environmental Engineering II, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAOKA MASAKI Graduate School of Global Environmental Studies Associate Professor,UEDA KAYO Graduate School of Engineering Associate Professor,FUJIMORI SHINICHIRO Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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 hybrid system is used, which consists of prerecorded lecture VIDEO, VCS (Video conference system) and SS (slide sharing system). 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.
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.

[Course objectives]

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.

[Course schedule and contents]

No.1
Global warming and Low carbon society （Assoc. Prof. Fuimori, Kyoto University）

No.2
Atmospheric diffusion and modeling (Prof. S Wang, Tsinghua University)

No.3
Air Pollution, Its Historical Perspective from Asian Countries (II), Malaysia (Assoc. Prof. Nasrin Aghamohammadi, University of Malaya)

No.4
Air Pollution, Its Historical Perspective from Asian Countries (III), Japan (Assoc. Prof. Ueda, Kyoto University)

No.5
Student Presentations /Discussions I (all)

Continue to 新環境工学特論II(2)↓↓↓

新環境工学特論II(2)

No.6
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.

Continue to 新環境工学特論II(3)↓↓↓

新環境工学特論II(3)

（Other information (office hours, etc.)）

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

未更新

Course number	G-ENG03 5F461 LJ77		
Course title (and course title in English)	**原子力環境工学** Nuclear Environmental Engineering, Adv.	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 inended 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.

[Course objectives]

By providing the students with the knowledge on various radioactive wastes generated by the use on neclear 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.

[Course schedule and contents]

Course Introduction ,1time,Course Introduction
Nuclear disaster action program,1time,uclear 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
Decomissining and clearance,1time,ecomissining 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)↓↓↓

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.

未更新

Course number	G-ENG03 6F468 SJ16		
Course title (and course title in English)	環境微量分析演習 Environmental Organic Micropollutants Analysis Lab.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SHIMIZU YOSHIHISA Graduate School of Engineering Associate Professor,MATSUDA TOMONARI

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understand about principle and practical techniques of chromatography. Understand about principle of several bioassays.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

It is required to attend all 3 days for lectures and experiments. Attendance and reports are considered for grading.

[Textbooks]

Handouts are distributed.

[References, etc.]

（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)

[Study outside of class (preparation and review)]

We hope active participation of students. It is welcome that patticipants 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.

Course number	G-ENG03 6F470 SB16		
Course title (and course title in English)	**環境工学先端実験演習** Advanced Enivironmental Engineering Lab.	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3,4	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

Analytical methods to characterize environmental samples are learnt through practical training including site visit to
other research institute or analytical company.

[Course objectives]

To promote your own research by learning each research method with wide vision

[Course schedule and contents]

1.Guidance and Safety Education: Ito
The content of subject and safety education for the following experiment are explained.

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.

4-5. Gas and Liquid Chromatography: Shimadzu corporation.
The principle of Gas and Liquid Chromatography is explained.

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.

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.

11. Bioassey: Hiyoshi Corporation
Qualitative and quantitative analysis of toxic compounds by bioassey is explained.

12. Making reports
This time is for making reports.

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.

Course number	G-ENG03 7F472 SJ16		
Course title (and course title in English)	環境工学実践セミナー Seminer on Practical Issues in Urban and Environmental Enginering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To

[Course schedule and contents]

Task assignment (1 time)
Select an academic society that will make a research presentation, and set a task.

Research / research (5 times)
Investigate and research on the set issues.

Presentation of research (1 time)
Do research presentations at academic societies etc.

Task assignment (1 time)
Select an academic society that will make a research presentation, and set a task.

Research / research (5 times)
Investigate and research on the set issues.

Presentation of research (1 time)
Do research presentations at academic societies etc.

Report creation (1 time)
We prepare a report that summarizes the contents released at academic societies, etc. and submit.

[Course requirements]

None

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.

Course number	G-ENG03 7P475 PB16		
Course title (and course title in English)	都市環境工学ORT ORT on Urban and Environmental Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

To

[Course schedule and contents]

Contents determination (1 time)
Select seminars, academic presentations, internship etc. where each student participates.

Research / Research (13 times)
Acquire specialized knowledge and experience through seminars, academic presentations and internships.

Report creation (1 time)
Seminar, conference presentation, internship etc, under the guidance of the teacher in charge, submit it as a report.

[Course requirements]

None

[Evaluation methods and policy]

The department head and the supervisor instructor will comprehensively evaluate the record describing the achievement record, thereby crediting the unit.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

Continue to 都市環境工学ORT(2)↓↓↓

都市環境工学ORT(2)

[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.

Course number	G-ENG03 5H424 LJ24		
Course title (and course title in English)	環境資源循環技術 Environmental-friendly Technology for Sound Material Cycle	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAOKA MASAKI Graduate School of Engineering Professor,Fujiwara Taku Graduate School of Engineering Associate Professor,NAKAGAWA HIROYUKI Graduate School of Engineering Associate Professor,MAKI TAISUKE Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI Graduate School of Engineering Senior Lecturer,HIDAKA TAIRA

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

We face global warming, resource depletion and ecological destruction etc. It is necessary to establish the environmental-friendly and sustainable society with low carbon emission and sound material cycles. This lecture is aimed at learning principle and fundamental knowledge on environmental sound technologies for biomass and related valuable resource in urban area.

[Course objectives]

Learn the environmental-friendly technology to realize the environmental-friendly and sustainable society with low carbon emission and sound material cycles.

[Course schedule and contents]

1st -5th Thermodynamic consideration of the technologies for resource cycle (Maki:2, Nakagawa:3)
Exergy, which is based on the combination of the first and the second law of thermodynamics, and the methodology to convert resources and to evaluate resource cycles utilizing exergy analysis is introduced with respect to the concept for resource cycles from the viewpoint of the second law of thermodynamics. “Global warming and carbon cycle”, “renewable resources and energy”, and “processes for the utilization of biomass” are also introduced.

6th-8th Technologies for resource cycle of solid waste(Fujiwara:2, Hidaka:1)
General knowledge, legal structures, applied technologies and analytical methods of solid waste (metal or inorganic resources) are introduced. The technologies of resource recovery in urban metabolic facilities are also introduced.

9th-11th Environmental-friendly Technology related to wastewater treatment(Takaoka:2, Oshita:1)
Technologies about material recycle and recovery related to water and wastewater treatment are introduced. Recovery of organic resource from sewage sludge, phosphorus recovery from sewage, and sewage systems which can enhance resources & energy recovery are explained together with their current conditions and challenges.

Continue to 環境資源循環技術(2)↓↓↓

環境資源循環技術(2)

[Course requirements]

None

[Evaluation methods and policy]

Evaluated by the reports for each theme and attendance.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Pre-homework is not necessary, but review the learning materials to make better reports.

（Other information (office hours, etc.)）

This class will be open in 2019. The number of class is 11th and is equivalent to 1.5 credits.

*Please visit KULASIS to find out about office hours.

Course number	G-ENG03 7U401 PJ16		
Course title (and course title in English)	都市環境工学特別セミナーA Seminar on Urban and Environmental Engineering A, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To

[Course schedule and contents]

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.

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)

[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.

Course number	G-ENG03 7U403 PJ16		
Course title (and course title in English)	都市環境工学特別セミナーB Seminar on Urban and Environmental Engineering B, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To

[Course schedule and contents]

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
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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.

Course number	G-ENG03 6X321 LE24 G-ENG55 6X321 LE24		
Course title (and course title in English)	環境リスク管理リーダー論 Lecture on Environmental Risk Management Leader	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SHIMIZU YOSHIHISA Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

In this class, wersquoll 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.

[Course objectives]

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.

[Course schedule and contents]

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#039s Lessens on Economy amp 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 amp Sanitary Engineering Research International Session,1time,
Poster Presentation in Environment amp Sanitary Engineering Research Symposium,1time,

[Course requirements]

None

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)

[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.

未更新

Course number	G-ENG04 5A832 LJ74		
Course title (and course title in English)	**構造材料特論** Theory of Structural Materials, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANEKO YOSHIO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Compositions, constitutive laws and applications of major structural materials including concrete and steel are lectured. Demanded performances of structural materials are explained from the view point of mutual dependencies between materials and structural systems. Furthermore, newly developed high performance materials (HPM), structural systems using HPM, and environmental control technique using structural materials are discussed.

[Course objectives]

1) To understand Compositions, constitutive laws and applications of major structural materials including concrete and steel as well as continual process of research, development and design from the material level up to the structural level. 2) To understand engineering meanings of structural materials in development of new structural systems and research trend of new structural materials. 3) To understand how to apply the varied structural materials into new structural systems and development of environmental control systems.

[Course schedule and contents]

,1time,
,4times,
Guidance and Structural Material (1) Basic Theory,4times,Basic properties, plastic theory, fracture theory, and softening characteristics of cementitious composites and steel are lectured. Fundamental principle of material constitutive laws and mathematical model of materials are explained.
Structural Material (2) New material,5times,Research trend and application of new materials are lectured. Fiber reinforced cementitious composites, intelligent-smart material, application of structural materials into new structural systems are explained.
Structural Material (3) Environmental Control,1time, Environmental controls of concrete and metallic materials are lectured. Health monitoring of concrete, environmental control systems using steel, production and environment of metallic materials are explained.

[Course requirements]

Basic knowledge on concrete, steel and structures.

[Evaluation methods and policy]

Evaluation will be made based on attendance to lectures and submissions of assignments.

[Textbooks]

Not assigned.

Continue to 構造材料特論(2)↓↓↓

構造材料特論(2)

[References, etc.]

（Reference books）

H. Mihashi, K. Rokugo and M. Kunieda (Editors): ldquoCrack of Concrete and Fracture Mechanics,rdquo Gihodo Publisher, Tokyo, July 2010, (in Japanese).

[Study outside of class (preparation and review)]

It should be studied based on pre-study and review.

（Other information (office hours, etc.)）

It is encouraged to ask questions and attend with positive mind.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG04 5A856 LJ74		
Course title (and course title in English)	居住空間計画学 Dwelling Planning	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YANAGISAWA KIWAMU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,2times,
,5times,
,5times,
,1time,

[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.

Course number	G-ENG04 5B013 LJ74		
Course title (and course title in English)	建築設計特論 Theory of Architectural Design, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRATA AKIHISA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understand the possibilities of theory linked to the reality of architectural design, and acquire the ability to think architecturally in a new era.

[Course schedule and contents]

Biological architecture (3 times)
Discuss the possibility of supple and inclusive architectural principles as an alternative to mechanistic architectural principles.

Architectural geometry (twice)
Discusses the modern significance of geometry and its practical potential in architectural design.

Architectural nature (twice)
Discuss the possibilities and techniques of rethinking architecture as a fusion rather than a conflict with nature.

Meaning of architecture (twice)
Discuss how we can recapture the problem of meaning in modern architecture.

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.

Learning achievement evaluation (1 time)
Evaluate learning achievement.

[Course requirements]

None

Continue to 建築設計特論(2)↓↓↓

建築設計特論(2)

[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.

Course number	G-ENG04 5B014 LJ74		
Course title (and course title in English)	建築環境計画論 I Theory of Architectural and Environmental Planning I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MIURA KEN

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

In this class students acquire subjective thinking abilities and advanced planning skills to discover and solve problems themselves through discussions and exercises.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Based on written reports and presentation

[Textbooks]

Classes will make use of printed handouts and projected slides.

Continue to 建築環境計画論 I (2)↓↓↓

建築環境計画論Ⅰ(2)

[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.

Course number	G-ENG04 5B015 LJ74				
Course title (and course title in English)	建築環境計画論II Theory of Architectural and Environmental Planning II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOSHIDA TETSU		
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

How privacy is dealt changes much firstly in the field of information and then architectural planning and urban planning and so on. Those topics are widely explained. Especially, in explanatory theory of human psychology and behavior in built-environment, formation of privacy feeling between family menbers and that feeling based on territorial behavior or owing to others sight line is explained. And to understand privacy of residents living in detached houses and apartment houses in built-up area designed and built by successive rebuilding way is mainly discussed. Furthermore, through field survey and presentation, understanding about subject matter will be enriched.

[Course objectives]

Enriching understanding about privacy dealt in architectural and urban planning field

[Course schedule and contents]

Privacy in post modern society,2times,
Explain outline how privacy is dealt in post-modern society in relation to advancement of informatization, and change of family conception.

Data privacy,2times,
Explain outline how privacy is dealt mainly in informatization field, such as change led after using SNS, handheld terminal and so on.

Privacy between members in family,2times,
Privacy between members in family in one house which began to be considered after the modern Enlightenment in Europe in general and Japan especially in architecture and urban field is explained

Privacy dealt in houses rebuilt by successively in built-up area,1time,
Develpment in built-up area designed and built by successive rebuilding way is explained. And get a better grasp that understanding of privacy feeling of residents in such area is important

Privacy after possession of territory,2times,
Formation of privacy feeling after possession of territory explained by proxemics theory is explained

Privacy dealt after comparing windows of houses and buildings to eyes,3times,
Formation of privacy feeling after comparing windows of houses and buildings to ones eyes is explained

Presentation by students,3times,
In addition to knowledge got from lecture, based on field survey and so on, presentation by students

Continue to 建築環境計画論II(2)↓↓↓

建築環境計画論 II (2)

Confirmation of level of attainment
Confirmation of level of attainment

[Course requirements]

General knowledge about proxemics (territorial) theory

[Evaluation methods and policy]

Presentation in class - 50%, Report at the end of period - 50%

[Textbooks]

Distribute original documents every time and help to understand using projector projection slide.

[References, etc.]

（Reference books）

Introduce reference book at every lesson.

[Study outside of class (preparation and review)]

Please carefully read the materials distributed in the lesson and review the content of the lesson.
It would be good enough, if you could get an understanding that "privacy" thought to be general can change at pre-modern, modern, post-modern throughout the lesson.
To this end, it is recommended obtaining information on how privacy should be treat and the relation to place in architecture and city from newspapers, television, and the internet.

（Other information (office hours, etc.)）

[Grading evaluation] 1time presentation in lesson, and 1report after all lessons. [Office Hour] (reception of questions, etc.) Thursday 12: 00-13: 00. For more information about office hours, please check KULASIS.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG04 5B016 LJ74		
Course title (and course title in English)	建築論特論 Theory of Architecture, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAJI TAKAHIRO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,1time,
,2times,
,2times,
,2times,
,1time,
,1time,

[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.

未更新

Course number	G-ENG04 5B019 LJ74		
Course title (and course title in English)	建築プロジェクトマネジメント論 Project Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANETA TAKASHI Graduate School of Engineering Associate Professor,NISHINOSAYAKA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Overview of Project Management and Construction Management in Japan.
Lecture and discussion.

[Course objectives]

To acquire the knowledge and the ability of project management.

[Course schedule and contents]

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.

[Course requirements]

Construction Engineering and Management I and II (undergraduate program) should be mastered.

[Evaluation methods and policy]

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.

未更新

Course number	G-ENG04 5B032 LJ74		
Course title (and course title in English)	応用固体力学 I Applied Solid Mechanics I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOSAKI MAKOTO Graduate School of Engineering Associate Professor,

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To learn fundamentals of solid mechanics

[Course schedule and contents]

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

[Course requirements]

Structural mechanics, linear algebra, vector analysis

[Evaluation methods and policy]

Final examination

[Textbooks]

Not used

[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.

未更新

Course number	G-ENG04 5B033 LJ74		
Course title (and course title in English)	応用固体力学II Applied Solid Mechanics II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOSAKI MAKOTO Graduate School of Engineering Associate Professor,

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Based on displacement method, approximate formulations for beams, plates shells are discussed.

[Course objectives]

To learn fundamentals of solid mechanics

[Course schedule and contents]

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 Wagnar'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

[Course requirements]

Structural mechanics, linear algebra, vector analysis

[Evaluation methods and policy]

Final xamination

[Textbooks]

Not used

[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.

未更新

Course number	G-ENG04 5B035 LJ74		
Course title (and course title in English)	人間生活環境デザイン論 Design Theory of Architecture and Human Environment	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANKI KIYOKO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

, **1** times,
,6times,
,2times,
,5times,
,1time,

[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.

未更新

Course number	G-ENG04 5B036 LJ74		
Course title (and course title in English)	建築史学特論 History of Japanese Architecture	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TOMISHIMA YOSHIAKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The objective of this course is to acquire research skills related to the investigation of architectural history topics.

[Course schedule and contents]

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

[Course requirements]

Ability to read Japanese ancient documents is necessary.

[Evaluation methods and policy]

Mid-term reports and final report.

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

It is desirable to observe the historic architecture which I took away by a class.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG04 5B037 LJ74		
Course title (and course title in English)	建築設計力学 Design Mechanics for Building Structures	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEWAKI IZURU Graduate School of Engineering Associate Professor,KOHEI FUJITA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Concept of inverse problem, 1 class,
Examples of inverse problem in terms of shear building models

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.

Strain-controlled design method for moment-resisting frames, 1 class,
Simple examples are used for understanding fundamental concepts of strain-controlled design.

Inverse problem via design sensitivity analysis, 1 class,
An inverse problem formulation via design sensitivity analysis (direct method) is explained.

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.

Performance-based Design, 1 class,
A design methodology based on the concept of performance-based design is explained.

Exercise 1, 1 class,
Exercise on inverse problems.

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.

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.

Course number	G-ENG04 5B038 LJ74		
Course title (and course title in English)	人間生活環境認知論 Theory of Cognition in Architecture and Human Environment	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,ISHIDA TAIICHIROU

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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)

（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.

未更新

Course number	G-ENG04 5B040 LJ74

Course title (and course title in English)	構造解析学特論 Analysis of Structures, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOSAKI MAKOTO Graduate School of Engineering Associate Professor,

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understanding of fundamentals of FEM

[Course schedule and contents]

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

[Course requirements]

Applied solid mechanics

[Evaluation methods and policy]

Final examination

[Textbooks]

Not used

Continue to 構造解析学特論(2)↓↓↓

構造解析学特論(2)

[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.

Course number	G-ENG04 5B043 LJ74		
Course title (and course title in English)	コンクリート系構造特論 Concrete Structures, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NISHIYAMA MINEHIRO Graduate School of Engineering Associate Professor,TANI MASANORI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

Course number	G-ENG04 5B044 LJ74		
Course title (and course title in English)	耐震構造特論 Earthquake Resistant Structures, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NISHIYAMA MINEHIRO Graduate School of Engineering Associate Professor,TANI MASANORI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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, hysterisis 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.

[Course objectives]

To undestand 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.

[Course schedule and contents]

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 Philogophy of capacity design.
,4times,
,4times,

[Course requirements]

Knowledge of vibration theory and knowledge concerning　reinforced concrete structures is assumed.

[Evaluation methods and policy]

Results will be assessed through a combination of examination results, submitted reports, and attendance.

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 Seimic 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 WileyampSons
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.

未更新

Course number	G-ENG04 5B046 LJ74				
Course title (and course title in English)	建築振動論 Dynamic Response of Building Structures		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HAYASHI YASUHIRO Graduate School of Engineering Associate Professor,SUGINO MINA Disaster Prevention Research Institute Associate Professor,NISHIJIMA KAZUYOSHI	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To enable accurate evaluation of the behavior of buildings in earthquakes, as well as accurate evaluation of earthquake resistance.

[Course schedule and contents]

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.

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.

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.

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.

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.

Course number	G-ENG04 5B052 LJ74		
Course title (and course title in English)	構造安全制御 Control for Structural Safety	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,IKEDA YOSHIKI Disaster Prevention Research Institute Associate Professor,KURATA MASAHIRO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The course help students to understand the fundamental theory behind anti-seismic design and the tips for their practical application.

[Course schedule and contents]

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)

[Course requirements]

None

[Evaluation methods and policy]

The performance of students are evaluated by the exercises provided during the lectures and the final test.

Continue to 構造安全制御(2)↓↓↓

構造安全制御(2)

[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.

Course number	G-ENG04 5B053 LJ74		
Course title (and course title in English)	建築環境物理学特論 Physics in Architectural Environmental Engineering,Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGURA DAISUKE Graduate School of Engineering Associate Professor,IBA CHIEMI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

It is assumed that you take undergraduate subjects such as Building Environment Engineering I, Building Facilities System.

[Evaluation methods and policy]

Terminal Exam.

Continue to 建築環境物理学特論(2)↓↓↓

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.

Course number	G-ENG04 5B054 LJ74		
Course title (and course title in English)	建築設備システム特論 Building Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,IBA CHIEMI Graduate School of Engineering Professor,OGURA DAISUKE

Target year	1st year students or above	Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understanding the concept of thermal/mass balance and optimal design in building equipment systems

[Course schedule and contents]

Introduction, 1 class
Provides an overview of the lecture content and procedure.

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.

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.

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.

Optimization problem, 2 classes
Formulation as an optimization problem for equipment systems.

Optimization techniques, 2 classes
Various optimization methods including the calculus method will be described.

Exercises and calculation, 2 classes
Exercises will be provided to promote better understanding of the content of the lecture.

Continue to 建築設備システム特論 (2)↓↓↓

建築設備システム特論 (2)

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.

Course number	G-ENG04 6B062 SJ74		
Course title (and course title in English)	建築学特別演習 I Seminar on Architecture and Architectural Engineering, I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOETAKA YUUJI

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

More than 15 times of seminars and discussions.

[Course requirements]

M1 students.

[Evaluation methods and policy]

Score is evaluated by contents amp materials of presentation and by overall progress of study.

[Textbooks]

To be specified during the course.

[References, etc.]

（Reference books）

To be specified during the course.

[Study outside of class (preparation and review)]

To be specified during the course.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG04 6B063 SJ74		
Course title (and course title in English)	建築学特別演習II Seminar on Architecture and Architectural Engineering, II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOETAKA YUUJI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

More than 30 times of seminars and discussions.

[Course requirements]

M2 students.

[Evaluation methods and policy]

Score is evaluated by contents amp materials of presentation and by overall progress of study.

[Textbooks]

To be specified during the course.

[References, etc.]

（Reference books）

To be specified during the course.

[Study outside of class (preparation and review)]

To be specified during the course.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG04 8B069 LJ74		
Course title (and course title in English)	建築技術者倫理 Architectural Engineer Ethics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NISHIYAMA MINEHIRO Graduate School of Engineering Professor,HARADA KAZUNORI Disaster Prevention Research Institute Professor,MAKI NORIO Graduate School of Engineering Associate Professor,YOSHIDA TETSU Graduate School of Engineering Associate Professor,IBA CHIEMI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.
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.

[Course objectives]

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.

[Course schedule and contents]

Architectural Design and Ethics (5 classes)
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.)
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.)
3. Environmental and energy issues and architectural ethics (architecture and reuse, environmental and ethical issues and ethics, environmental consciousness and architectural technology, etc.)
4. Ideas and technology concerning nature and architecture (forest resources and architecture, consideration and control of nature, architectural reuse technology and concepts, etc.)

Structural Design and Ethics (6 classes)
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

Continue to 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 cosideration of architecture including utility design plays an important roll in reducing environmental impact during the lifecyle 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 buidings 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.

未更新

Course number	G-ENG04 7B071 PJ74		
Course title (and course title in English)	インターンシップⅠ（建築） Internship I, Architectural Design Practice	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANKI KIYOKO Graduate School of Engineering Associate Professor,YOSHIDA TETSU

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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,

[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.

未更新

Course number	G-ENG04 7B073 PJ74		
Course title (and course title in English)	インターンシップII（建築） Internship II, Architectural Design Practice	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANKI KIYOKO Graduate School of Engineering Associate Professor,YOSHIDA TETSU

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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,

[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.

Course number	G-ENG04 7B075 PJ74		
Course title (and course title in English)	建築設計実習 Architectural Design Practice	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRATA AKIHISA

Target year		Number of credits	6	Year/semesters	2021/First semester
Days and periods	Mon.4,5,Tue.4,5,Wed.4,5,Thu.1,Fri.3,5	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

未更新

Course number	G-ENG04 7B077 SJ74		
Course title (and course title in English)	建築設計演習 I Architecture Design Studio I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAJI TAKAHIRO

Target year		Number of credits	4	Year/semesters	2021/First semester
Days and periods	Thu.4,5,Fri.1,2	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,2times,
,8times,
,2times,

[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.

未更新

Course number	G-ENG04 7B079 SJ74				
Course title (and course title in English)	建築設計演習II Architecture Design Studio II		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,DANIELL，Thomas Charles Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE	
Target year		Number of credits	4	Year/semesters	2021/Second semester
Days and periods	Thu.4,5,Fri.3,5	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,2times,
,8times,
,2times,

[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.

未更新

Course number	G-ENG04 7B080 PJ74		
Course title (and course title in English)	建築工事監理実習 Construction Supervision Practice	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANETA TAKASHI Graduate School of Engineering Associate Professor,NISHINOSAYAKA Part-time Lecturer,MIZUKAWA TAKAHIKO

Target year	1st year students or above	Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3,4	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

Engineering and practice of architects and supervisors required by architects law and building law.

[Course objectives]

To acquire the knowledge and the ability for architects and supervisors jobs.

[Course schedule and contents]

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.

[Course requirements]

Construction Engineering and Management I and II (undergraduate program) should be mastered.

[Evaluation methods and policy]

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.

[Textbooks]

Not used

[References, etc.]

（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)

[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.

Course number	G-ENG04 7B088 SJ74		
Course title (and course title in English)	建築学総合演習 Exercises in Architecture and Architectural Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOETAKA YUUJI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Research guidance and practice (30 times)
Research meetings and guidance for individual students with laboratory seminars more than 30 times in total.

[Course requirements]

In principle, two years of study are required.

[Evaluation methods and policy]

Comprehensively judge report materials, understanding of research contents, research management skills, and presentation skills.

[Textbooks]

To be instructed during the exercise.

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

To be instructed during the exercise.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG04 5B100 LJ74		
Course title (and course title in English)	静粛環境工学 Silence amenity engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,OOTANI MAKOTO Graduate School of Engineering Professor,TAKANO YASUSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 confortable 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.

[Course objectives]

Objective of this silence amenity engineering course is to get basic understand of sound radiation theory and mechanism, which is necessary to control noise.

[Course schedule and contents]

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)

[Course requirements]

Understanding of geometrical acoustics within the texts for Environmental Engineering of Architecture II, or equivalent is required.

[Evaluation methods and policy]

Overall grading will be given based on student presentation (30%), and report (70%).

Continue to 静粛環境工学(2)↓↓↓

静粛環境工学(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.

Course number	G-ENG04 5B222 LJ74		
Course title (and course title in English)	環境制御工学特論 Environmental Control Engineering, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HARADA KAZUNORI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The participants are to acquire basic concept of environmental control and to be ready for conducting research on heat and air quality studies.

[Course schedule and contents]

Introduction (1 week)
The history of numerical analysis in environmental control is presented.

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.

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.

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.

End-term examination and evaluation of achievements (1 week)
Checking degree of understanding.

[Course requirements]

Knowledge on Environmental Engineering in Architecture I [U-ENG24 24009 LJ74] and II [U-ENG24 24010 LJ74] is assumed.

Continue to 環境制御工学特論(2)↓↓↓

環境制御工学特論(2)

[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.

未更新

Course number	G-ENG04 5B226 LJ74		
Course title (and course title in English)	建築地盤工学 Building Geoenvironment Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEWAKI IZURU Graduate School of Engineering Associate Professor,KOHEI FUJITA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

Course number	G-ENG04 5B231 LJ74		
Course title (and course title in English)	高性能構造工学 High Performance Structural Systems Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOETAKA YUUJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Elasto-plastic behavior and design of steel frame structures
The 1st class: Elasto-plastic behavior of steel members
The 2nd class: Plastic analysis of one-story frames
The 3rd class: Plastic collapse load of multi-story frames
The 4th class: Plastic design of multi-story frames
The 5th class: Plastic collapse load of beam-hinging type 3D frames with eccentricity
The 6th class: Plastic design of steel frames with buckling-restrained braces
The 7th class: Plastic design of steel frames with ordinary braces

Ultimate behavior and design of steel members
The 8th class: Flexural buckling of compression members
The 9th class: Inelastic flexural buckling and behavior after flexural buckling
The 10th class: Buckling restraint and design of buckling-restained brace
The 11th class: Lateral-torsional buckling
The 12th class: Ultimate behavior of flexural members
The 13th class: Ultimate behavior of members under bending moments and axial force
The 14th class: Local buckling of steel plates

Feedback of course
The 15th class: Summaries and conclusions

[Course requirements]

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)

[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.

Course number	G-ENG04 5B234 LJ74		
Course title (and course title in English)	鋼構造特論 Steel Structures, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOETAKA YUUJI Graduate School of Engineering Assistant Professor,TAKATSUKA KOHEI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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

[Course requirements]

Would be preferable to have completed Mechanics of Building Structures and Steel Construction.

[Evaluation methods and policy]

Evaluation will be based on the scores of five times of reports (20 points per a report).

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.

Course number	G-ENG04 5B238 LJ74				
Course title (and course title in English)	建築風工学 Architectural Wind Engineering		Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,MARUYAMA TAKASHI Disaster Prevention Research Institute Associate Professor,NISHIJIMA KAZUYOSHI	
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Acquisition of knowledge on prediction and evaluation for wind load and wind environment around new construction planned building.

[Course schedule and contents]

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.

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.

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.

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.

Method of wind environment prediction - 2, 2 classes:
These classes will explain the foundation of fluid dynamics and provide the examples of calculation.

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

Continue to 建築風工学(2)↓↓↓

建築風工学(2)

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 meteolorogy 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.

Course number	G-ENG04 5B241 LJ74

Course title (and course title in English)	都市災害管理学 Urban Disaster Management	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,MATSUSHIMA SHINICHI Disaster Prevention Research Institute Professor,Yuki Sakai Disaster Prevention Research Institute Associate Professor,NISHINO TOMOAKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

Basic knowledge of anti-seismic engineering and environmental engineering

[Evaluation methods and policy]

[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.

未更新

Course number	G-ENG04 5B259 LJ74		
Course title (and course title in English)	音響空間設計論 Theory of Acoustic Space Design in Architecture	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,OOTANI MAKOTO Graduate School of Engineering Professor,TAKANO YASUSHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

For the realization of optimal acoustic space design in architecture, it is essential to understand
- Prediction of physical parameters of sound field in architecture
- Measurement and analysis of sound field
- Perception and cognition of acoustic space

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.

[Course objectives]

In-depth understandings of
- Prediction of acoustic space - Measurement and analysis of acoustic space
- Theory and method of perceptual evaluation for optimal acoustic space design in architecture.

[Course schedule and contents]

Introduction,1time, Overview
Acoustics,1time, Acoustics for understanding behavior of sound field and sound wave
Acoustic signal processing,1 time, Acoustic signal processing for measurement, analysis, and control of sound field
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.
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.
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.
Auralization of sound field, 2 times, Auralization of acoustic space in architecture in its design stage. Theories and methods of acoustic space.
Presentation,4times,Participants#039 presentation and discussion on research survey in the field of acoustic environment.

[Course requirements]

None

Continue to 音響空間設計論(2)↓↓↓

音響空間設計論(2)

[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.

未更新

Course number	G-ENG04 5i017 LE74		
Course title (and course title in English)	建築学コミュニケーション（専門英語） Architecture Communication	Instructor's name, job title, and department of affiliation	Part-time Lecturer,TSOI, Esther Graduate School of Engineering Professor,DANIELL，Thomas Charles

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

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 ” .

[Course objectives]

Able to use fluent English for communicating and presenting architectural ideas.

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

[Course schedule and contents]

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.

Wk 2*: Glass and Steel 1: review on historical development and modern details.
Submission and presentation about first essay.

Wk 3: Glass and Steel 2: review on historical development and modern details.
Continue presentation about first essay.

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.

Continue to 建築学コミュニケーション（専門英語）(2)↓↓↓

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%.

Continue to 建築学コミュニケーション（専門英語）(3)↓↓↓

建築学コミュニケーション（専門英語）(3)

[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

Kenneth Frampton, Modern Architecture: A Critical History, Thames and Hudson, 1992.
https://doubleoperative.files.wordpress.com/2009/12/kenneth-frampton_modern-architecture.pdf

Le Corbusier, Towards a New Architecture, Dover, 1986.
https://cisematakblog.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

Gunter Nitschke, From Shinto to Ando, Academy, 1993.
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://wwwedu.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

（Related URLs）

http://wwwedu.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(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(Construction History)
https://1drv.ms/b/s!AhVq_riAFrGsgShPD7LwDAseZAb9(Space, Time & Architecture)
https://1drv.ms/w/s!AhVq_riAFrGsgTy57oqLy253JJD1(Beaubourg Effect)
https://1drv.ms/b/s!AhVq_riAFrGsgSu28rkaBXp_f9cs(The Theater of Industry)

Continue to 建築学コミュニケーション（専門英語）(4)↓↓↓

建築学コミュニケーション（専門英語）(4)

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=1000000000000(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.

未更新

Course number	G-ENG34 6Q005 SJ74		
Course title (and course title in English)	建築設計・計画学セミナーＩ Seminar on Architectural Design and Planning I	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[Course requirements]

None

[Evaluation methods and policy]

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.

未更新

Course number	G-ENG34 6Q006 SJ74		
Course title (and course title in English)	建築設計・計画学セミナーII Seminar on Architectural Design and Planning II	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[Course requirements]

None

[Evaluation methods and policy]

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.

未更新

Course number	G-ENG34 6Q008 SJ74		
Course title (and course title in English)	建築構造学セミナーⅠ Seminar on Structural Engineering of Buildings I	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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 dorctoral thesis.

[Course objectives]

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.

[Course schedule and contents]

A research presentation (15 times):
Students make research presentation, and has a question-and-answer session.

[Course requirements]

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.

[Evaluation methods and policy]

Evaluation is based on the presentation and the reports which describe the comment over other students' presentation.

[Textbooks]

Not used

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.

未更新

Course number	G-ENG33 6Q009 SJ74		
Course title (and course title in English)	建築構造学セミナーII Seminar on Structural Engineering of Buildings II	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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 dorctoral thesis.

[Course objectives]

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.

[Course schedule and contents]

A research presentation (15 times):
Students make research presentation, and has a question-and-answer session.

[Course requirements]

[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.

[Evaluation methods and policy]

Evaluation is based on the presentation and the reports which describe the comment over other students' presentation.

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.

Course number	G-ENG34 6Q011 SJ74				
Course title (and course title in English)	建築環境工学セミナーⅠ Seminar on Environmental Engineering I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGURA DAISUKE Graduate School of Engineering Professor,HARADA KAZUNORI Graduate School of Engineering Professor,TAKANO YASUSHI		
Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The course intends to summarize the development of his/her own research, to develope skills to convey his/her ideas to the researchers in other areas and to join discussions in multiple viewpoints properly.

[Course schedule and contents]

Research presentations and discussion,15times,Participants shall make presentations on the research of his/her own and make discussions among other participants and instructors.

[Course requirements]

As a general rule, students belonging to laboratories on the architectural environmental engineering are permitted to attend.

[Evaluation methods and policy]

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 intension, 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.

[Textbooks]

To be specified during the course.

[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.

Course number	G-ENG34 6Q012 SJ74		
Course title (and course title in English)	建築環境工学セミナーII Seminar on Environmental Engineering II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGURA DAISUKE Graduate School of Engineering Professor,HARADA KAZUNORI Graduate School of Engineering Professor,TAKANO YASUSHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The course intends to summarize the development of his/her own research, to develope skills to convey his/her ideas to the researchers in other areas and to join discussions in multiple viewpoints properly.

[Course schedule and contents]

Research presentations and discussion,15times,Participants shall make presentations on the research of his/her own and make discussions among other participants and instructors.

[Course requirements]

As a general rule, students belonging to laboratories on the architectural environmental engineering are permitted to attend.

[Evaluation methods and policy]

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 intension, 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.

[Textbooks]

To be specified during the course.

[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.

Course number	G-ENG34 6Q013 SJ74				
Course title (and course title in English)	建築環境工学セミナーIII Seminar on Environmental Engineering III		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGURA DAISUKE Graduate School of Engineering Professor,HARADA KAZUNORI Graduate School of Engineering Professor,TAKANO YASUSHI	
Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The course intends to summarize the development of his/her own research, to develope skills to convey his/her ideas to the researchers in other areas and to join discussions in multiple viewpoints properly.

[Course schedule and contents]

Research presentations and discussion,15times,Participants shall make presentations on the research of his/her own and make discussions among other participants and instructors.

[Course requirements]

As a general rule, students belonging to laboratories on the architectural environmental engineering are permitted to attend.

[Evaluation methods and policy]

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 intension, 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.

[Textbooks]

To be specified during the course.

[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.

Course number	G-ENG34 6Q014 SJ74		
Course title (and course title in English)	建築環境工学セミナーIV Seminar on Environmental Engineering IV	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGURA DAISUKE Graduate School of Engineering Professor,HARADA KAZUNORI Graduate School of Engineering Professor,TAKANO YASUSHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The course intends to summarize the development of his/her own research, to develope skills to convey his/her ideas to the researchers in other areas and to join discussions in multiple viewpoints properly.

[Course schedule and contents]

Research presentations and discussion,15times,Participants shall make presentations on the research of his/her own and make discussions among other participants and instructors.

[Course requirements]

As a general rule, students belonging to laboratories on the architectural environmental engineering are permitted to attend.

[Evaluation methods and policy]

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 intension, 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.

[Textbooks]

To be specified during the course.

[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.

Course number	G-ENG34 6Q015 SJ74		
Course title (and course title in English)	建築構造学セミナーIII Seminar on Structural Engineering of Buildings III	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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 dorctoral thesis.

[Course objectives]

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.

[Course schedule and contents]

A research presentation (15 times):
Students make research presentation, and has a question-and-answer session.

[Course requirements]

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.

[Evaluation methods and policy]

Evaluation is based on the presentation and the reports which describe the comment over other students' presentation.

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.

未更新

Course number	G-ENG34 6Q016 SJ74		
Course title (and course title in English)	建築構造学セミナーIV Seminar on Structural Engineering of Buildings IV	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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 dorctoral thesis.

[Course objectives]

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.

[Course schedule and contents]

A research presentation (15 times):
Students make research presentation, and has a question-and-answer session.

[Course requirements]

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.

[Evaluation methods and policy]

Evaluation is based on the presentation and the reports which describe the comment over other students' presentation.

[Textbooks]

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.

未更新

Course number	G-ENG34 6Q017 SJ74

Course title (and course title in English)	建築設計・計画学セミナーIII Seminar on Architectural Design and Planning III	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[Course requirements]

None

[Evaluation methods and policy]

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.

未更新

Course number	G-ENG34 6Q018 SJ74

Course title (and course title in English)	建築設計・計画学セミナーIV Seminar on Architectural Design and Planning IV	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[Course requirements]

None

[Evaluation methods and policy]

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.

Course number	G-ENG34 5Q021 LJ74		
Course title (and course title in English)	先端建築学特論 I Advanced Theory of Architecture and Architectural Engineering I	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Ability to write original dissertations on cutting-edge issues in architectural planning and environmental engineering.

[Course schedule and contents]

(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.

[Course requirements]

Students must belong to the laboratories on architectural planning or environment engineering.

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.

未更新

Course number	G-ENG34 5Q022 SJ74

Course title (and course title in English)	先端建築学特論II Advanced Theory of Architecture and Architectural Engineering II	Instructor's name, job title, and department of affiliation	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 YUUJI Disaster Prevention Research Institute Professor,Yuki Sakai

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Acquire the ability to write original articles on advanced theme on structural engineering

[Course schedule and contents]

15, 15 classes,
Presentation and discussion on advanced theme on structural engineering

[Course requirements]

None

[Evaluation methods and policy]

Grade based on the result of student effort.

[Textbooks]

Not used

Continue to 先端建築学特論II(2)↓↓↓

先端建築学特論II(2)

[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.

未更新

Course number	G-ENG04 5X401 LJ74		
Course title (and course title in English)	デザイン方法論 Design Methodology	Instructor's name, job title, and department of affiliation	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,HIRATA AKIHISA

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

In the 21st century, it is required to reconsider what is a design and what is a design method. The era a simple artifact is requested is over, and we have to create environmental and social systems including various relations such as the relation among artifacts, the relation between artifacts and men amp environment, and the relation among human beings. The role of design is to develop ldquoHuman Centered Design (HCD)rdquo which creates meaningful experiences through system integration of man-environmental systems. In this lecture, we explore the design methodology as a basic theory of design after 1960rsquos, explaining design problems, design process, design method, design thinking, and design science based on the design studies in various design fields such as craft, product, architecture, city, landscape, environment, community, education, society, mobility, business, and information. Especially to investigate the mechanism of creative design thinking is very important to solve the daily life problems and many difficult problems human kind encounters. Therefore we explain the design semiotics to clarify the mechanism of generating creative designs and to show valuable examples.

[Course objectives]

[Course schedule and contents]

,1time,
,3times,
,3times,
,3times,
,3times,
,2times,

[Course requirements]

None

Continue to デザイン方法論(2)↓↓↓

デザイン方法論(2)

[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.

未更新

Course number	G-ENG04 5X413 LJ74		
Course title (and course title in English)	建築構造デザイン論 Design Theory of Architectural Structure	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HAYASHI YASUHIRO Graduate School of Engineering Associate Professor,SUGINO MINA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

This course will discuss the following necessary components of urban and architectural structural design:
#8226 Means of developing practical design solutions under difficult conditions or with complex design requirements
#8226 Practical challenges and solution methods of structural design
#8226 Ways of addressing extreme situations and meeting new challenges

[Course objectives]

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).

[Course schedule and contents]

Structures and structural capabilities (3 classes)
We will discuss the structural capabilities of structures and ways of thinking about their evaluation.
#8226 History of earthquake damage and earthquake-proofing standards, domestic-international comparison of earthquake-proofing standards, minimum levels and unexpected loads, tsunami
#8226 Life cycle design, risk evaluation and risk management, insurance
#8226 Capability design, capability display, capability control, damage control, monitoring, structural and non-structural capabilities, etc.

Orientation of structural design (6 classes)
We will discuss structural methods, construction methods, and building methods, based on case studies.
Differences in structures depending on structural materials (concrete, iron, wood, glass, paper, plastic, soil, etc.), innovative structural materials
Seismic isolation
Vibration control
Challenges related to breadth and length
Challenges related to height
New forms
Creating beautiful forms
Frameworks of living things, structures of manmade objects such as rockets, aircraft, and cars

Regional and cultural revitalization design (2 classes)
Preservation and revitalization of cultural properties, traditional wooden construction, historical structures
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.)

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.

Course number	G-ENG05 6B418 LB71　G-ENG06 6B418 LB71		
Course title (and course title in English)	**先進材料強度論** Strength of Advanced Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI Graduate School of Engineering Associate Professor,NISHIKAWA MASAAKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The course goal is to understand basic concepts of composite materials and the underlying mechanism of their mechanical properties from multiscale viewpoints, while the phsyical understanding of composites is developed based on multiple disciplines.

[Course schedule and contents]

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.

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.

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.

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.

11-13. Fracture mechanics properties
 Fracture mechanics of anisotropic materials are described. The interlaminar fracture toughness and

Continue to 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.

未更新

Course number	G-ENG06 5G001 LJ71　G-ENG07 5G001 LJ77　G-ENG05 5G001 LJ71				
Course title (and course title in English)	応用数値計算法 Applied Numerical Methods		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,INOUE YASUHIRO Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 programing exercise is included in this lecture.

[Course objectives]

Understandings of mathematical theories and programing implementations of the numerical methods.

[Course schedule and contents]

1. Introduction Introduction of this class
 - Numerical representations and errorsMacro programing 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

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 programing

[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.

Course number	G-ENG05 5G003 LJ71 G-ENG06 5G003 LJ71 G-ENG07 5G003 LJ77

Course title (and course title in English)	**固体力学特論** Solid Mechanics, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Associate Professor,SHIMADA TAKAHIRO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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

[Course requirements]

This course requires basic knowledge of mechanics of materials and solid mechanics.

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, ldquoFoundation and Application of Elastoplasticityrdquo Morikita (1995) (in Japanese) E. Neto et al., ldquoComputational Methods for Plasticity,rdquo John Wiley amp 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.

未更新

Course number	G-ENG07 5G005 LJ77 G-ENG05 5G005 LJ71 G-ENG06 5G005 LJ71		
Course title (and course title in English)	熱物理工学 Thermal Science and Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUMOTO MITSUHIRO Graduate School of Engineering Professor,IWAI HIROSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 enviroinments and hydrogen energy are described.

[Course objectives]

Microscopic Viewpoints: Ability of multi-scale modelling
Macroscopic Viewpoints: Ability of global environment modelling

[Course schedule and contents]

(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,

[Course requirements]

Elementary thermodynamics, Statistical physics, Heat transfer engineering, Numerical analysis etc.

[Evaluation methods and policy]

Reports

[Textbooks]

handout

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Not necessary

（Other information (office hours, etc.)）

(2018)
Matsumoto: April 8 ~ May 227
Yoshida: June 3 ~ July 22

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG06 5G007 LJ71　G-ENG07 5G007 LJ77　G-ENG05 5G007 LJ71		
Course title (and course title in English)	基盤流体力学 Introduction to Advanced Fluid Dynamics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HANAZAKI HIDESHI Graduate School of Engineering Professor,TAKATA SHIGERU Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

, 5 times,
, 5 times,
, 4 times,
, 1 times,

[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.

未更新

Course number	G-ENG06 5G009 LJ71　G-ENG07 5G009 LJ77　G-ENG05 5G009 LJ71		
Course title (and course title in English)	量子物性物理学 Quantum Condensed Matter Physics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,SENAMI MASATO Graduate School of Engineering Associate Professor,NAKAJIMA KAORU Graduate School of Engineering Associate Professor,SHIKAMA TAIICHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,3times,
,4times,
,1time,
,1time,
,1time,
,1time,
,1time,

[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.

未更新

Course number	G-ENG05 5G011 LJ71　G-ENG07 5G011 LJ77　G-ENG06 5G011 LJ71		
Course title (and course title in English)	設計生産論 Design and Manufacturing Engineering	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,3times,
,2times,
,3times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG05 5G013 LJ71　G-ENG06 5G013 LJ71　G-ENG07 5G013 LJ77		
Course title (and course title in English)	**動的システム制御論** Dynamic Systems Control Theory	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SAWARAGI TETSUO Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI Graduate School of Engineering Professor,FUJIMOTO KENJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,4times,
,1time,

[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.

未更新

Course number	G-ENG05 7G041 LE71　G-ENG06 7G041 LE71		
Course title (and course title in English)	**有限要素法特論** Advanced Finite Element Method	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NISHIWAKI SHINJI Graduate School of Engineering Senior Lecturer,Lim,　Sunghoon

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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).
Mathematical background of the FEM,2times,Variational calculus and the norm space, the convergence of the solutions.
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.
Classifications of nonlinearities and their formulations,4times,Classifications of nonlinearities and numerical methods to deal with these nonlinearities.
Numerical practice,2times,Numerical practice using COMSOL.
Evaluation of student achievements,1time,

[Course requirements]

Solid Mechanics

[Evaluation methods and policy]

Grading is based the quality of two or three reports and the final exam.

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.

Course number	G-ENG05 6G049 PJ71　G-ENG06 6G049 PJ71		
Course title (and course title in English)	インターンシップM（機械工学群） Engineering Internship M	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,KUROSE RYOUICHI

Target year	1st year students or above	Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

On-site learning of the importance of teamwork and production processes in manufacturing is also the aim.

[Course objectives]

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.

[Course schedule and contents]

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.
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).

[Course requirements]

None

[Evaluation methods and policy]

Credits (2) are approved based on the summary report (50%) and presentation (50%) about the internship activities.

[Textbooks]

Not used

[References, etc.]

（Reference books）

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.

Course number	

Course title (and course title in English)	English Technical Writing English Technical Writing	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NISHIWAKI SHINJI Part-time Lecturer,Wever Steve

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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ついて，演習を交えながら，講述する．

[Course objectives]

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．

[Course schedule and contents]

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.

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.

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.

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.

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.

6) The Experimental Section
This class will examine what features and language are required for the experimental section of a paper.

Continue to English Technical Writing (2)↓↓↓

English Technical Writing (2)

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。

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.

未更新

Course number	G-ENG05 8G057 LJ71　G-ENG06 8G057 LJ71　G-ENG07 5G057 LJ77

Course title (and course title in English)	技術者倫理と技術経営 Engineering Ethics and Management of Technology	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To cultivate a spirit of self-sufficiency needed for engineers

[Course schedule and contents]

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,

[Course requirements]

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)

[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.

<table>
<tr><td>Course number</td><td colspan="5">G-ENG05 5G058 SJ71　G-ENG06 5G058 SJ71</td></tr>
<tr><td>Course title (and course title in English)</td><td colspan="2">複雑系機械工学基礎セミナー１
Basic Seminar of Complex Mechanical Engineering,1</td><td>Instructor's name, job title, and department of affiliation</td><td colspan="2">Graduate School of Engineering
Professor,HIRAKATA HIROYUKI
Graduate School of Engineering
Senior Lecturer,SUGIMOTO HIROSHI
Graduate School of Engineering
Associate Professor,AOI SHINYA</td></tr>
<tr><td>Target year</td><td></td><td>Number of credits</td><td>1</td><td>Year/semesters</td><td>2021/First semester</td></tr>
<tr><td>Days and periods</td><td>Tue.1</td><td>Class style</td><td>Seminar</td><td>Language of instruction</td><td>English</td></tr>
</table>

[Overview and purpose of the course]

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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

Course number	G-ENG06 5G059 SJ71　G-ENG05 5G059 SJ71		
Course title (and course title in English)	複雑系機械工学基礎セミナー２ Basic Seminar of Complex Mechanical Engineering,2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KUROSE RYOUICHI Graduate School of Engineering Associate Professor,NAKAJIMA KAORU Graduate School of Engineering Associate Professor,KOUNO DAISUKE

Target year		Number of credits	1	Year/semesters	2021/Second semester
Days and periods	Thu.1	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

Course number	G-ENG06 5G061 LJ71　G-ENG05 5G061 LJ71		
Course title (and course title in English)	応用数理科学 Applied mathematical sciences	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,INOUE YASUHIRO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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。

[Course objectives]

数理的な課題解決に必要となる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。

[Course schedule and contents]

○概論（1）　数理モデルの構築に必要となる考え方を学ぶ。

○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（4）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（4）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となる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。

[Course requirements]

微積分、確率・統計に関する基本的な知識

[Evaluation methods and policy]

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。

[Textbooks]

Not used

Continue to 応用数理科学(2)↓↓↓

応用数理科学(2)

[References, etc.]

（Reference books）

Introduced during class

[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.

Course number	G-ENG06 7V003 LB71　G-ENG05 7V003 LB71		
Course title (and course title in English)	バイオメカニクス Biomechanics	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,ADACHI TAIJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

This lecture will be provided in Japanese.

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．

[Course objectives]

This lecture will be provided in Japanese.

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．

[Course schedule and contents]

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

[Course requirements]

None

Continue to バイオメカニクス(2)↓↓↓

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.

Course number	G-ENG35 6V019 PJ71　G-ENG34 6V019 PJ71		
Course title (and course title in English)	インターンシップDS（機械工学群） Engineering Internship DS	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,KUROSE RYOUICHI

Target year	1st year students or above	Number of credits	4	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Credits (4) are approved based on the summary report (50%) and presentation (50%) about the internship activities.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[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.

Course number	G-ENG34 6V020 PJ71　G-ENG35 6V020 PJ71

Course title (and course title in English)	インターンシップDL（機械工学群） Engineering Internship DL	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,KUROSE RYOUICHI

Target year	1st year students or above	Number of credits	6	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Credits (6) are approved based on the summary report (50%) and presentation (50%) about the internship activities.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[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.

Course number	G-ENG34 7V025 SE71　G-ENG35 7V025 SE71		
Course title (and course title in English)	複雑系機械工学セミナーA Seminar of Complex Mechanical Engineering for the 21st Century COE Program,A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI Graduate School of Engineering Associate Professor,AOI SHINYA

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

Course number	G-ENG35 7V027 SE71　G-ENG34 7V027 SE71				
Course title (and course title in English)	複雑系機械工学セミナーB Seminar of Complex Mechanical Engineering for the 21st Century COE Program,B		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KUROSE RYOUICHI Graduate School of Engineering Associate Professor,NAKAJIMA KAORU Graduate School of Engineering Associate Professor,KOUNO DAISUKE	
Target year		Number of credits	1	Year/semesters	2021/Second semester
Days and periods	Thu.1	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

Course number	G-ENG34 7V029 SE71　G-ENG35 7V029 SE71		
Course title (and course title in English)	複雑系機械工学セミナーC Seminar of Complex Mechanical Engineering for the 21st Century COE Program,C	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI Graduate School of Engineering Associate Professor,AOI SHINYA

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

Course number	G-ENG34 7V031 SE71　G-ENG35 7V031 SE71		
Course title (and course title in English)	複雑系機械工学セミナーＤ Seminar of Complex Mechanical Engineering for the 21st Century COE Program,D	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KUROSE RYOUICHI Graduate School of Engineering Associate Professor,NAKAJIMA KAORU Graduate School of Engineering Associate Professor,KOUNO DAISUKE

Target year		Number of credits	1	Year/semesters	2021/Second semester
Days and periods	Thu.1	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

Course number	G-ENG34 7V033 SE71　G-ENG35 7V033 SE71		
Course title (and course title in English)	複雑系機械工学セミナーE Seminar of Complex Mechanical Engineering for the 21st Century COE Program,E	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI Graduate School of Engineering Associate Professor,AOI SHINYA

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

Course number	G-ENG34 7V035 SE71　G-ENG35 7V035 SE71		
Course title (and course title in English)	複雑系機械工学セミナーF Seminar of Complex Mechanical Engineering for the 21st Century COE Program,F	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KUROSE RYOUICHI Graduate School of Engineering Associate Professor,NAKAJIMA KAORU Graduate School of Engineering Associate Professor,KOUNO DAISUKE

Target year		Number of credits	1	Year/semesters	2021/Second semester
Days and periods	Thu.1	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

All activities should be done in English.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG05 8X402 LB18　G-ENG06 8X402 LB18

Course title (and course title in English)	アーティファクトデザイン論 Theory for Designing Artifacts	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SAWARAGI TETSUO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

The activity of design is fundamentally similar across a wide variety of domains. I use artifact in a broad and atypical sense to describe any product of intentional creation, including physical goods, services, information systems, buildings, landscapes, organizations, and societies. The central theme of this lecture is that a unifying framework informs the human activity of design across all domains. Especially, understanding user needs is a key element of problem definition, and that understanding is usually best developed with interactive and immersive methods. In this lecture, a variety of methodologies for participatory systems approach and an idea of user-experience are provided, and its contributions to the design process are discussed.

[Course objectives]

This course is aimed at developing the ability to apply methods for identifying problems and interactively analyzing/evaluating systems, based on understanding of the principles of artifact design and on systematic thinking.

[Course schedule and contents]

Introduction,1time,We will shed light on the concept of artifacts as something to be put on equal footing with natural objects and examine the history of artifacts in terms of how they were viewed in different ages?namely, artifacts as modes of representation in the ancient world, artifacts as necessities for survival in the middle ages, artifacts as forms of convenience in modern times, and artifacts as a means of perpetuation in the current era.

Artifact function and purpose,3times,The effects that artifacts have on the outside world?i.e., other things?are ldquofunctions.rdquo Function is the concept of questioning the existence of an artifact, and design is the formulation of functions for achieving an intended purpose. We will discuss the categorization of artifacts in terms of how the ldquopurposerdquo of artifacts relates to the context in which they are used, and look at the origins of artifacts from the perspective of semiosis.

Artifact design principles,2times,To understand an artifact is to know how its internal structure acts on the outside world to realize its function. Today, cybernetics?which has explored the interaction between the physical world and the world of information?is expanding into a concept that encompasses society as well (second-order cybernetics), and concepts have been put forward for actively rethinking how human cognition and decision-making interact with the outside world (ecological approaches, socially distributed cognition, naturalistic decision-making). We will examine artifact design principles based on theories related human activity at the boundary of these externalities.

Artifact design representation and evaluation,3times,Design must fulfill its role of enhancing the quality of life through the creation of not only individual artifacts, but also environments and social systems that encompass groups of artifacts and natural objects. We will discuss the path toward expanding the scope of design from physical objects to environments and social systems that include intangible services, including

Continue to アーティファクトデザイン論(2)↓↓↓

with regard to problem development/representation methods, how to set purposes of design, how to eliminate the ambiguities and conflicts among various goals, searching for alternative design strategies, design evaluation, and principles and methods of consensus-forming among different stakeholders.
User-centered artifact design,2times,The quality of designs is something to be evaluated by the user, and hence there must be collaboration between users and designers/producers. Moreover, complex design challenges cannot be resolved by experts of only one discipline; they must be tackled by pooling the design-related knowledge of different domains. We will discuss the concept of user-centered design, design rationale, and international standards of design processes for achieving design that is grounded in the userrsquos needs/perspective.
Participatory systems approach,2times,In order to deal with the design of large-scale, complex artifacts, one must take the approach of systemically structuring problems and basing design on diverse perspectives. We will broadly examine: interactive processes among system designers, users, and computers; methods of structurally modeling problems through repeated dialogue between experts in relative disciplines and computers; and ways of supporting the perceptions, interpretations, and decision-making of designers and users. We will also consider the utility of the participatory systems approach in smooth, effective implementation of system design.
Exercise in participatory systems approach,2times,Students will apply the participatory systems approach to a real-world artifact design challenge, and report the results of this exercise.

[Course requirements]

None

[Evaluation methods and policy]

Students will be evaluated based on the following criteria, in the order listed. (1) Exercises assigned in class: approx. 20% (2) Final exam: approx. 60% (3) Contributions to classwork (e.g., asking good questions): approx. 20%

[Textbooks]

Lecture notes used in class will be distributed as needed. Refer to ldquoTextbook (supplemental)rdquo below.

[References, etc.]

（Reference books）

1. 吉川弘之 [2007] 人工物観, 横幹, 1(2), 59-65 2. Suh, N.P. [1990] The Principles of Design, Oxford University Press （邦訳：スー(翻訳：畑村洋太郎)「設計の原理? 創造的機械設計論」, 朝倉書店, 1992.） 3. 吉川弘之 [1979] 一般設計学序説, 精密機械45 (8) 20?26, 1979. 4. Vladimir Hubka and W. Ernst Eder [1995] Design Science, Springer 5. Simon,H.[1996] The Sciences of the Artificial Third edition 秋葉元吉、吉原英樹訳[1999]『システムの科学』パーソナルメディア 6. H・A・サイモン[1979] 稲葉元吉・倉井武夫訳, 『意思決定の科学』,産業能率大学出版部 7. Hutchins, Edwin [1995] Cognition in the Wild. MIT Press 8. Klein, G., Orasanu, J., Calderwood, R., and Zsambok, C.E. [1993] Decision Making in Action: Models and Methods. Ablex Publishing Co., Norwood, NJ. 9. D・ノーマン[1986] The Design of Everyday Things, 野島久雄訳『誰のためのデザイン?：認知科学者のデザイン原論』、新曜社 10. 椹木、河村[1981]：参加型システムズ・アプローチ―手法と応用、日刊工業新聞社ほか

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)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Office hours will be held for one hour before and after each class period (preferably 5th period on Tuesdays, but also 3rd period on Wednesdays). Appointments for other times can be requested by e-mail.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG07 6X411 LJ77　G-ENG05 6X411 LB71　G-ENG06 6X411 LB71		
Course title (and course title in English)	複雑系機械システムのデザイン Design of Complex Mechanical Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SAWARAGI TETSUO Institute for Frontier 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

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,2times,
,2times,
,2times,

[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.

未更新

Course number	G-ENG05 6B407 LB71		
Course title (and course title in English)	ロボティクス Robotics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUNO FUMITOSHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 ldquomanipulationrdquo 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.

[Course objectives]

[Course schedule and contents]

,1time,
,4times,
,1time,
,3times,
,3times,
,2times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

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.

未更新

Course number	G-ENG05 6B622 LB71		
Course title (and course title in English)	熱物性論 Thermophysics for Thermal Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUMOTO MITSUHIRO Graduate School of Engineering Professor,KUROSE RYOUICHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understanding the principle mechanisms of phase transition, cooperation phenomena, patern formation, and relaxation phenomena, in terms of advanced statistical mechanics and non-equilibrium thermodynamics.

[Course schedule and contents]

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#039s reciprocal relation
Check and Feedback,1time,

[Course requirements]

Undergraduate level of Thermophysics, Heat transfer phenomena, and Statistical physics

[Evaluation methods and policy]

Paper assignments

[Textbooks]

Lecture note will be prepared.

[References, etc.]

（Reference books）

will be listed in the class.

[Study outside of class (preparation and review)]

Exercises with simple numerical simulations are given.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	

Course title (and course title in English)	量子ビーム物質解析学 Analysis of Materials by Quantum Beams	Instructor's name, job title, and department of affiliation	Institute for Integrated Radiation and Nuclear Science Professor,OKUCHI TAKEO Institute for Integrated Radiation and Nuclear Science Associate Professor,MORI KAZUHIRO Institute for Integrated Radiation and Nuclear Science Assistant Professor,ONODERA YUHEI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.4	Class style		Language of instruction	Japanese

[Overview and purpose of the course]

炭とダイヤモンドは、同じ炭素でてきていても、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。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。

[Course objectives]

物質に対する量子ビームの散乱・回折の基本原理を学び、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。

[Course schedule and contents]

1．量子ビーム（X線、中性子線、電子線、自由電子レーザー、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・不規則系物質の原子配列の解析と物性の起源
4．結晶・不規則系物質の原子・ナノスケールダイナミクス
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．機械材料の残留応力の観察
7．中性子ラジオグラフィ
8．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

[Course requirements]

固体物理

[Evaluation methods and policy]

レポートを提出してもらい、講義内容の理解度を問う。

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.

未更新

Course number	G-ENG05 7B631 LB71

Course title (and course title in English)	高エネルギー材料工学 High Energy Radiation Effects in Solid	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

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.

[Course objectives]

To understand reactions and property changes of materials under radiation and high-energy particle irradiation.

[Course schedule and contents]

,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

[Course requirements]

Basic knowledge on materials engineering and mechanics

[Evaluation methods and policy]

Grading is based on small quizzes and report submission (if necessary) on the lecture.

Continue to 高エネルギー材料工学(2)↓↓↓

高エネルギー材料工学(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.

Course number	G-ENG05 6G017 LB71

Course title (and course title in English)	破壊力学 Fracture Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Associate Professor,NISHIKAWA MASAAKI Graduate School of Engineering Associate Professor,SHIMADA TAKAHIRO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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。

[Course objectives]

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。

[Course schedule and contents]

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

[Course requirements]

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。

[Evaluation methods and policy]

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。

[Textbooks]

中井善一、久保司郎著 『破壊力学』（朝倉書店）

Continue to 破壊力学(2)↓↓↓

破壊力学(2)

[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.

未更新

Course number	G-ENG05 7G021 LB71

Course title (and course title in English)	光物理工学 Engineering Optics and Spectroscopy	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HASUO MASAHIRO Graduate School of Engineering Associate Professor,SHIKAMA TAIICHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understand the principles of optical engineering and spectroscopy.
 Develop application abilities based on the principle understanding.

[Course schedule and contents]

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,

[Course requirements]

Undergraduate-level electromagnetism and quantum mechanics.

[Evaluation methods and policy]

Grade evaluation will be based on report examination.

[Textbooks]

Recommended books will be discussed in class.

[References, etc.]

（Reference books）

Lecture notes will be distributed.

[Study outside of class (preparation and review)]

Preparation and review will be discussed in class.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG05 6G025 LB71		
Course title (and course title in English)	メカ機能デバイス工学 Mechanical Functional Device Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOMORI MASAHARU Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understand the principles and basic characteristics of the prime movers and tribology taken up in the lecture.

[Course schedule and contents]

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

[Course requirements]

Nothing.

[Evaluation methods and policy]

Evaluate comprehensively by participation in class, tests, reports, etc.

[Textbooks]

Instruct as necessary.

Continue to メカ機能デバイス工学(2)↓↓↓

メカ機能デバイス工学(2)

[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.

未更新

Course number	G-ENG34 6G031 SB71		
Course title (and course title in English)	機械理工学セミナーA Seminar on Mechanical Engineering and Science A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,5times,

[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.

未更新

Course number	G-ENG34 6G032 SB71		
Course title (and course title in English)	機械理工学セミナーB Seminar on Mechanical Engineering and Science B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,5times,

[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.

未更新

Course number	G-ENG05 6G036 SB71		
Course title (and course title in English)	機械理工学基礎セミナーA Basic Seminar on Mechanical Engineering and Science A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG05 6G037 SB71		
Course title (and course title in English)	機械理工学基礎セミナーB Basic Seminar on Mechanical Engineering and Science B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG05 6G039 LB71		
Course title (and course title in English)	熱物質移動論 Transport Phenomena	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NAKABE KAZUYOSHI Graduate School of Engineering Associate Professor,TATSUMI KAZUYA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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

[Course requirements]

It'll be desireable to take lectures of core subjects 'Introduction to Advanced Fluid Dynamics' and 'Thermal Science and Engineering.'

Continue to 熱物質移動論(2)↓↓↓

熱物質移動論(2)

[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.

未更新

Course number	G-ENG05 6G051 EB71		
Course title (and course title in English)	機械理工学特別実験及び演習第一 Experiments on Mechanical Engineering and Science,Adv. I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,9times,
,10times,
,10times,

[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.

未更新

Course number	G-ENG05 6G053 EB71				
Course title (and course title in English)	機械理工学特別実験及び演習第二 Experiments on Mechanical Engineering and Science,Adv. II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO		
Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,9times,
,10times,
,10times,
,1time,

[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.

未更新

Course number	G-ENG05 6G403 LB71		
Course title (and course title in English)	最適システム設計論 Optimum System Design Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NISHIWAKI SHINJI Graduate School of Engineering Associate Professor,IZUI KAZUHIRO Graduate School of Engineering Senior Lecturer,Lim,　Sunghoon

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,4times,
,2times,
,5times,
,2times,
,1time,

[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.

Course number	G-ENG05 6Q402 LB71				
Course title (and course title in English)	乱流力学 Turbulence Dynamics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HANAZAKI HIDESHI		
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

流体力学の自然現象や工学への適用においては、浮力やコリオリ力の効果が重要となる。それらの効果が顕著となる成層流体や回転流体を例にとりながら、流体中の【波動と乱流の基礎】を学習する。

[Course objectives]

流体中の波動と乱流の基礎を、成層流体や回転流体などを例にとり、学習する。

[Course schedule and contents]

１．成層流体の基本的性質（4回）：鉛直方向に密度差のある成層流体が持つ、基本的な（特殊な）性質について解説する（成層流体の支配方程式、静水圧平衡、物体を過ぎる流れとブロッキング、浮力振動数、渦位の保存則、ブシネスク近似）。

２．波動（5回）：位相速度と群速度、波の線形分散関係、成層流体中の内部重力波、物体による内部重力波の励起と伝播。

３．乱流（3回）：一様等方性乱流（慣性領域と散逸領域、次元解析とKolmogorovスケール）、成層乱流（Ozmidovスケール、運動エネルギーと位置エネルギーのエネルギー交換、密度の鉛直フラックスによる熱・物質輸送）。

４．拡散（2回）：拡散方程式と平均２乗変位、乱流拡散（Taylor拡散、短時間極限と長時間極限）

５．フィードバック（1回）

[Course requirements]

前提とするのは、学部レベルの基礎的な流体力学（質量保存の式、流体の運動方程式、ベルヌイの定理、基本的なベクトル解析）。

[Evaluation methods and policy]

学期末のレポートにより評価する。ただし、学期途中にレポート課題を出した場合は、その評価も加味することがある（１～２割程度）。

【評価基準】
到達目標について、
A＋：すべての観点においてきわめて高い水準で目標を達成している。
A　：すべての観点において高い水準で目標を達成している。

Continue to 乱流力学 (2)↓↓↓

乱流力学 (2)

B　：すべての観点において目標を達成している。
C　：大半の観点において学修の効果が認められ、目標をある程度達成している。
D　：目標をある程度達成しているが、更なる努力が求められる。
F　：学修の効果が認められず、目標を達成したとは言い難い。

[Textbooks]

Not used
講義ノートと、随時配布する補足プリントだけで一応完結するように講義する予定です。

[References, etc.]

（Reference books）
A.E.Gill 『Atmosphere-Ocean Dynamics』（1982）ISBN:0-12-283522-0（←波動の基礎、特に成層流体中の内部重力波についてはこの本の６章（特に6.４～6.6節）。）

[Study outside of class (preparation and review)]

授業のノートを復習することが望ましい。

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG05 7Q610 LB71

Course title (and course title in English)	原子系の動力学セミナー Seminar: Dynamics of Atomic Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUMOTO MITSUHIRO Graduate School of Engineering Professor,INOUE YASUHIRO Graduate School of Engineering Associate Professor,SHIMADA TAKAHIRO Graduate School of Engineering Associate Professor,NISHIKAWA MASAAKI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

- Understanding the basics of particle simulations
- Mastering data analysis techniques

[Course schedule and contents]

Basics of MD simulations (M.Matsumoto),6times,- Numerical simulation of equations of motion - Model potentials - Data analysis - Equilibrium vs. non-equilibrium
Application: Thermofluidal systems (M. Matsumoto),2times,- Lennard-Jones fluids - Interface, phase change, energy transport, etc.
Application: Polymeric materials (Nishikawa),2times,- Fundamentals on mechanical (viscoelastic) properties of polymer materials - Application of molecular dynamics method of polymer materials
Application: Biosystems (Inoue),1time,- MD simulation of biomolecular systems - Recent examples
Application: Solid systems (R. Matsumoto),1time,- Deformation and destruction - Alternative methods
Application: Quantum systems (Shimada),2times,- First principle MD - Mechanical and electronic properties on nanoscale
Check and Feedback,1time,

[Course requirements]

Elementary Level of
 Analytical mechanics, Quantum mechanics, Material science, Thermodynamics, Statistical physics, Numerical analysis

[Evaluation methods and policy]

Reports, presentation/discussion

[Textbooks]

Not used

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)

[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.

未更新

Course number	G-ENG05 6Q807 LB71		
Course title (and course title in English)	デザインシステム学 Theory for Design Systems Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SAWARAGI TETSUO Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,3times,
,3times,
,2times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG34 7V012 SJ71		
Course title (and course title in English)	機械理工学特別演習Ａ Advanced Exercise in Mechanical Engineering and ScienceA	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG34 7V013 SJ71

Course title (and course title in English)	機械理工学特別演習Ｂ Advanced Exercise in Mechanical Engineering and ScienceB	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester

Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG34 7V014 SJ71		
Course title (and course title in English)	機械理工学特別演習C Advanced Exercise in Mechanical Engineering and ScienceC	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG34 7V015 SJ71				
Course title (and course title in English)	機械理工学特別演習Ｄ Advanced Exercise in Mechanical Engineering and ScienceD		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO	
Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG34 7V016 SJ71		
Course title (and course title in English)	機械理工学特別演習Ｅ Advanced Exercise in Mechanical Engineering and ScienceE	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG34 7V017 SJ71		
Course title (and course title in English)	機械理工学特別演習 F Advanced Exercise in Mechanical Engineering and ScienceF	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HIRAYAMA TOMOKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

Course number	G-ENG06 7B617 LB71		
Course title (and course title in English)	量子分子物理学特論 Quantum Theory of Molecular Physics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,SENAMI MASATO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To understand fundamental physics to apply quantum mechanics to phenomena of atoms or molecules.

[Course schedule and contents]

1. Analytic mechanics and symmetry in physics,2times,Principle of least action, Equation of motion, Hamiltonian mechanics, Symmetry and conservation law in physics, Noether's theorem, Group theory
2. Classical relativistic theory,2times,Invariance of the speed of light, Lorentz transformation, Relativistic form of electromagnetism, Four component vector potential
3. Relativistic quantum mechanics,4-6times,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 Chrality
4. A primer of quantum field theory,2-4times,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,2times,Time evolution and propagator, Transition amplitude and path integral, Aharonov-Bohm effect, Path integral in quantum field theory

Confirmation ,1time,

[Course requirements]

Quantum Mechanics

[Evaluation methods and policy]

Evaluation will be based on assignments (four - six times, 100 points).

[Textbooks]

Not used

[References, etc.]

（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.

未更新

Course number	G-ENG06 5G204 LJ51		
Course title (and course title in English)	マイクロファブリケーション Microfabrication	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Assistant Professor,URABE KEIICHIRO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

To obtain fundamental knowledge about design and fabrication of micro/nano systems and to be familiar with recent fabrication technologies and micro/nano systems.

[Course schedule and contents]

Week 1: introduction
・ Microfabrication and devices
Week 2 to 4: Advanced semiconductor device fine processing technology
・ Front-end process flow
・ Photolithography basics and recent topics
・ Plasma etching
Week 5 to 7: Thin film material process
・ Formation process of thin film material which is the basis of micro system and its evaluation technology
Week 8 to 10: Silicon micromachining
・ Processing process based on semiconductor fine processing technology (silicon micromachining)
・ Mechanical properties of silicon
・ Evaluation of mechanical properties of micro-scale materials
Week 11 to 12: 3D processing lithography
・ High-aspect, three-dimensional structure fabrication methods that are important for microsystems
・ Lithography technology, etching technology
Week 13 to 14: Basics of Applied Devices
・ Sensors / actuators
・ Analysis technology
Week 15: feedback on evaluations such as reports

[Course requirements]

None

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)

[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.

Course number	G-ENG06 5G206 LE51		
Course title (and course title in English)	マイクロ・バイオシステム Micro/bio system	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YOKOKAWA RYUUJI Institute for Frontier Life and Medical Sciences Senior Lecturer,OKEYO, Kennedy Omondi Institute for Advanced Study Associate Professor,KAMEI KENICHIROU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The course is based on micro/nano fabrication described in Microfabrication (10G203). It is highly recommended to register for the course as well.

Continue to マイクロ・バイオシステム (2)↓↓↓

マイクロ・バイオシステム (2)

[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.

未更新

Course number	G-ENG06 6G211 LB71		
Course title (and course title in English)	物性物理学１ Solid State Physics 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUZUKI MOTOFUMI Graduate School of Engineering Associate Professor,NAKAJIMA KAORU

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Students will learn the basics of solid-state physics through turn-based lecturing and reading of Chapters 2-6 of C. Kittle'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.

[Course objectives]

Understanding the various underlying concepts in solid-state physics, such as inverse lattices, phonons, and free electrons

[Course schedule and contents]

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.

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.

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.

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.

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.

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.

Continue to 物性物理学１(2)↓↓↓

物性物理学１(2)

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.

未更新

Course number	G-ENG06 5G214 LJ71		
Course title (and course title in English)	精密計測加工学 Precision Measurement and Machining	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Program-Specific Associate Professor,BEAUCAMP, Anthony Tadeus Herve

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understand the basic principles of precision mesurement and machining associated with the applications

[Course schedule and contents]

Basics of measurement and machining,1time,Concept of accuracy, precision, Relation of measurement, machining, and control
Basics of precision measurement,2times,
Optical mesurement,4times,
,3times,
,1time,
,2times,
,2times,

[Course requirements]

None

[Evaluation methods and policy]

Small exams in the term and the final exam

[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.

未更新

Course number	G-ENG35 6G216 SB51		
Course title (and course title in English)	マイクロエンジニアリングセミナーA Seminar on Micro Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,-times,
,-times,
,-times,

[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.

未更新

Course number	G-ENG35 6G217 SB51		
Course title (and course title in English)	マイクロエンジニアリングセミナーＢ Seminar on Micro Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,-times,
,-times,
,-times,

[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.

未更新

Course number	G-ENG06 7G223 SB51		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG06 7G224 SB51		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG06 7G226 EB51

Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

, **1** times,
,9times,
,10times,
,10times,

[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.

未更新

Course number	G-ENG06 7G228 EB51		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,9times,
,10times,
,10times,
,1time,

[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.

未更新

Course number	G-ENG06 6V201 LB51

Course title (and course title in English)	微小電気機械システム創製学 Micro Electro Mechanical System Creation	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,YOKOKAWA RYUUJI Graduate School of Engineering Senior Lecturer,BANERJEE, Amit

Target year		Number of credits	2	Year/semesters	2021/Second semester

Days and periods	Fri.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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 fullfill 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.

[Course objectives]

Acquire the knowledge and skill to design and analyze a microsystem.

[Course schedule and contents]

* Tutorial on microsystem CAD software, 2times
Master CAD program for microsystem design and analysis which will be utilized to accomplish an assignment.
* Lecture and Task Introduction,2times
Learn basic knowledge necessary to design a microsystem/MEMS(Micro Electromechaical Systems) utilizing microfabrication technology.
* Design and analysis work, 4times
Analyze and design a microsystem by communicating with a team member
of HKUST.
* Presentation I, 2times
The designed device and its analyzed results is presented in detail by team in English.
* Evatuation of device, 3times
Evaluate the fabricated microsystem.
* Presentation II, 2times
The measured results and comparison between the analyzed results of the fabricated microsystem is presented by team in English.

[Course requirements]

Students are required to take the 10G204 course Microfabrication provided in 1st term.

[Evaluation methods and policy]

【Evaluation method】
Evaluation will be based on presentatins (60 points) and the end of the term assignments (40 points).
【Evaluation standard】
Presentations are evaluated with not only design, simulation and measurement results of device, but also

Continue to 微小電気機械システム創製学(2)↓↓↓

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) by the end of 1st term.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG06 7V205 LB71		
Course title (and course title in English)	物性物理学２ Solid State Physics 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUZUKI MOTOFUMI Graduate School of Engineering Associate Professor,NAKAJIMA KAORU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Students will learn the basics of solid-state physics through turn-based lecturing and reading of chapters from Ch. 7 onward of C. Kittle'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.

[Course objectives]

Learning the basics of metal and semiconductor physics

[Course schedule and contents]

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, conductions 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.

未更新

Course number	G-ENG35 7V210 SJ71		
Course title (and course title in English)	マイクロエンジニアリング特別演習A Advanced Exercise in Micro Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG35 7V211 SJ71				
Course title (and course title in English)	マイクロエンジニアリング特別演習Ｂ Advanced Exercise in Micro Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI		
Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG35 7V212 SJ71				
Course title (and course title in English)	マイクロエンジニアリング特別演習Ｃ Advanced Exercise in Micro Engineering C	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI		
Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG35 7V213 SJ71		
Course title (and course title in English)	マイクロエンジニアリング特別演習D Advanced Exercise in Micro Engineering D	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG35 7V214 SJ71		
Course title (and course title in English)	マイクロエンジニアリング特別演習E Advanced Exercise in Micro Engineering E	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG35 7V215 SJ71				
Course title (and course title in English)	マイクロエンジニアリング特別演習Ｆ Advanced Exercise in Micro Engineering F	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI		
Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

Course number	G-ENG07 6C430 LJ77		
Course title (and course title in English)	航空宇宙機力学特論 Advanced Flight Dynamics of Aerospace Vehicle	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,AOI SHINYA Graduate School of Engineering Professor,SENDA KEI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Flight Dynamics and Control of Aerospace Vehicles including Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechamics, etc.

[Course objectives]

To understand analytical mechanics through flight dynamics of aerospace vehicles: Basic items of Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechamics, etc.

[Course schedule and contents]

Analytical Mechanics,7times,1. Newton equations, 2. Lagrange equations, 3. Hamilton equations
Orbital Mechamics,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

[Course requirements]

Foundation of mechanics and mathematics, Flight Dynamics of Aerospace Vehicle (Undergraduate)

[Evaluation methods and policy]

Evaluation depends on marks of examination (approximately 80%) and exercises (approximately 20%). Both marks should be 60% or better.

[Textbooks]

Instructed during class

[References, etc.]

（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』 （Iwnami 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.

Course number	G-ENG07 6G230 LJ77		
Course title (and course title in English)	動的固体力学 Dynamics of Solids and Structures	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,BIWA SHIROU Graduate School of Engineering Assistant Professor,ISHII YOSUKE

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Week 1: Fundamentals of elastodynamics (1) (Expressions of stress and strain; Conservation laws; Hooke's law; Principle of virtual work)
Week 2: Fundamentals of elastodynamics (2) (Hamilton's principle and its applications)
Week 3: Basics of wave propagation (1) (One-dimensional wave equation; D'Alembert's solution; Harmonic waves)
Week 4: Basics of wave propagation (2) (Spectral analysis; Waves in structural members; Dispersive waves; Phase and group velocities)
Week 5: 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 6: Waves in isotropic elastic media (Navier's equations; Longitudinal and transverse waves; Plane elastic waves in isotropic solids)
Week 7: Waves in anisotropic elastic media (1) (Voigt representation; Plane elastic waves in anisotropic solids; Christoffel's equation; Acoustic tensor)
Week 8: Waves in anisotropic elastic media (2) (Plane waves in solids with cubic symmetry; Energy flux; Slowness surfaces)
Week 9: Reflection and transmission (1) (Reflection and transmission of normally incident waves; Snell's law; Mode conversion)
Week 10: Reflection and transmission (2) (Reflection and refraction of obliquely incident waves; Total reflection)
Week 11: Guided elastic waves (Bulk waves and guided waves; Rayleigh wave)
Week 12: Guided elastic waves (Lamb wave; SH plate wave; Love wave; Dispersion and multiple modes)
Week 13: Dynamic fracture mechanics (1) (Linear fracture mechanics; Stress intensity factor; Energy release rate)
Week 14: Dynamic fracture mechanics (2) (Stationary cracks under dynamic loading; Propagating cracks)
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.

未更新

Course number	G-ENG07 6G405 LJ77		
Course title (and course title in English)	推進工学特論 Propulsion Engineering, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ERIGUCHI KOUJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,2times,
,4times,
,2times,
,2times,
,1time,
,1time,

[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.

未更新

Course number	G-ENG07 6G406 LJ77		
Course title (and course title in English)	気体力学特論 Gas Dynamics, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKATA SHIGERU Graduate School of Engineering Assistant Professor,HATTORI MASANARI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,3times,
,2times,
,4times,
,3times,
,2times,

[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.

未更新

Course number	G-ENG07 6G409 LJ77		
Course title (and course title in English)	航空宇宙システム制御工学 Aerospace Systems and Control	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUJIMOTO KENJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To acquire modern control theory and nonlinear control useful for mechatronics and aerospace engineering.

[Course schedule and contents]

Three lectures on aerospace and control:
1. State-space equations, 2. Basics of variational methods, 3 Integrability and Forbenius' theorem

Four lectures on stability and dissipativity:
1. Lyapunov stability, 2. La Salle's invariance principle, 3. Lp stability, 4. Dissipativity

Four lectures on optimal control:
1. Optimal control, 2. Dynamic programming, 3. Maximum principle, 4. Control Lyapunov function and inverse optimality

Three lectures on nonlinear control synthesis:
1. Passivity and passivity theorem, 2. Hamiltonian systems and passivity based control, 3. Feedback linearization.

The last lecture gives a summary.

[Course requirements]

Dynamical Systems Control Theory

[Evaluation methods and policy]

The score will be evaluated based on reports.

Continue to 航空宇宙システム制御工学(2)↓↓↓

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.

未更新

Course number	G-ENG07 6G411 LJ77		
Course title (and course title in English)	航空宇宙流体力学 Fluid Dynamics for Aeronautics and Astronautics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOWADA TAKU Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,3times,
,3times,
,4times,

[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.

Course number	G-ENG07 6G418 SJ77		
Course title (and course title in English)	航空宇宙工学特別実験及び演習第一 Experiments and Exercises in Aeronautics and Astronautics I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,BIWA SHIROU

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The purpose is to grasp the current trend/important issues and establish the direction of one's research for master's thesis.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Grading is based on the attendance, the progress reports, the presentation and discussion at seminars.

[Textbooks]

Not used

[References, etc.]

（Reference books）

References are suggested by supervisors according to the research topic.

[Study outside of class (preparation and review)]

Reading of the suggested references is required through the term.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG07 6G420 SJ77		
Course title (and course title in English)	航空宇宙工学特別実験及び演習第二 Experiments and Exercises in Aeronautics and Astronautics II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,BIWA SHIROU

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

The purpose is to grasp the current trend/important issues and clarify the originality of one's research for master's thesis.

[Course schedule and contents]

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.

[Course requirements]

Experiments and Exercises in Aeronautics and Astronautics I is a prerequisite in principle.

[Evaluation methods and policy]

Grading is based on the attendance, the progress reports, the presentation and discussion at seminars.

[Textbooks]

Not used

[References, etc.]

（Reference books）

References are suggested by supervisors according to the research topic.

[Study outside of class (preparation and review)]

Reading of the suggested references is required through the term.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG07 5M226 LJ58　G-ENG07 33410 LJ58

Course title (and course title in English)	気象学 I Meteorology I	Instructor's name, job title, and department of affiliation	Graduate School of Science Professor,ISHIOKA KEIICHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

, 2～4 times,
, 2～4 times,
, 2～4 times,
, 2～4 times,
, 2～4 times,

[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.

未更新

Course number	G-ENG07 5M227 LJ58 G-ENG07 44407 LJ58				
Course title (and course title in English)	気象学II Meteorology II	Instructor's name, job title, and department of affiliation	Graduate School of Science Professor,ISHIOKA KEIICHI		
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,３～４times,
,３～４times,
,３～４times,
,３～４times,

[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.

Course number	G-ENG36 7R410 SJ71		
Course title (and course title in English)	航空宇宙機システムセミナー Seminar on Aerospace systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SENDA KEI Graduate School of Engineering Associate Professor,AOI SHINYA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.4	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

Mechanics,
Vehicle Mechanics,
Orbital Mechanics,
etc.

[Course objectives]

To understand Aerospace Systems:
Mechanics,
Vehicle Mechanics,
Orbital Mechanics,
etc.

[Course schedule and contents]

Aerospace Systems: 15times
1. Reading textbooks
2. Reviewing journal papers

[Course requirements]

None

[Evaluation methods and policy]

Evaluation depends on marks of presentation, report, and so on.

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

Introduced during class

[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.

未更新

Course number	G-ENG36 7R419 SJ71		
Course title (and course title in English)	システム制御工学セミナー Seminar on Systems and Control	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MARUTA ICHIROU Graduate School of Engineering Professor,FUJIMOTO KENJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

To acquire the skills of grasping the trends of research related to control system theory particularly for aeronautics and astronautics.

[Course objectives]

To acquire the skills of grasping the trends of research related to control system theory particularly for aeronautics and astronautics.

[Course schedule and contents]

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

[Course requirements]

None

[Evaluation methods and policy]

The score will be evaluated using reports.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

For presentation, preparation is required.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG36 7V401 SJ71		
Course title (and course title in English)	電離気体工学セミナー Seminar on Engineering Science of Ionized Gases	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ERIGUCHI KOUJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG36 7V405 SJ71		
Course title (and course title in English)	航空宇宙流体力学セミナー Seminar on Fluid Dynamics for Aeronautics and Astronutics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOWADA TAKU Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,14times,
,1time,

[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.

未更新

Course number	G-ENG36 7V436 SJ71		
Course title (and course title in English)	最適システム設計工学セミナー Seminar on Optimum System Design Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NISHIWAKI SHINJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,8times,
,7times,

[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.

未更新

Course number	G-ENG36 7V412 SJ71				
Course title (and course title in English)	気体力学セミナー Seminar on Gas Dynamics		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKATA SHIGERU	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

Course number	G-ENG36 7V413 SJ71		
Course title (and course title in English)	機能構造力学セミナー Seminar on Mechanics of Functional Solids and Structures	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,BIWA SHIROU

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.4	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

This Seminar is 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, and advanced experimental techniques for structural health monitoring.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

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.

[Evaluation methods and policy]

Grading is based on the literature survey, presentation, discussion and the final report.

[Textbooks]

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.

Course number	G-ENG08 5C004 LJ57		
Course title (and course title in English)	場の量子論 Quantum Field Theory	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Assistant Professor,OGURE KENZOU Graduate School of Engineering Associate Professor,MIYADERA TAKAYUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

An introduction to quantum field theory is presented with an emphasis on its mathematical difficulties.
We may use online materials. Check PandA in advance.

[Course objectives]

Our aim is to understand the difficulty of relativistic quantum field theory caused by the Poincare covariance and the infinite degrees of freedom.

[Course schedule and contents]

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

[Course requirements]

Analysis, linear algebra, quantum mechanics

Continue to 場の量子論(2)↓↓↓

場の量子論(2)

[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.

未更新

Course number	G-ENG08 7C013 LJ28

Course title (and course title in English)	核材料工学 Nuclear Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAGI IKUJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Fission reactor materials, 5 classes: Give an overview of fission reactors and discuss the below components.
- Fuel (recoverable reserves, uranium abundance ratio, nuclear cross sections, MOX)
- Cladding material (zirconium alloy, corrosion, hydrogen embrittlement)
- Control material (absorption cross sections, control rods, burnable poisons)
- Moderators (scattering cross sections, moderating efficiency, diffusion length)
- Coolants (thermal properties, radioactivation, furnace types)
- Structural materials (pressure vessels, mechanical properties, radiation damages)

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.
- Structural materials (radioactivation, radiation damages, mechanical properties, effects of 14MeV neutrons)
- Coil materials (alloy superconductivity, compound superconductivity)
- Blankets (tritium breeding materials, neutron multiplication materials, fuel cycle)
- Plasma facing materials (loss and redeposition, hydrogen recycling, tritium inventory and leakage)

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.

未更新

Course number	G-ENG08 7C014 LJ28				
Course title (and course title in English)	核燃料サイクル工学１ Nuclear Fuel Cycle 1		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,TAISHI KOBAYASHI	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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

[Course requirements]

None

[Evaluation methods and policy]

Based on report evaluation of the issues on the contents of the nuclear fuel cycle.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

It is desirable to review mainly after the lecture.

（Other information (office hours, etc.)）

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.

Course number	G-ENG08 7C015 LJ28		
Course title (and course title in English)	核燃料サイクル工学2 Nuclear Fuel Cycle 2	Instructor's name, job title, and department of affiliation	Institute for Integrated Radiation and Nuclear Science Professor,YAMAMURA Tomoo Graduate School of Engineering Assistant Professor,TABATA　CHIHIRO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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．

[Course objectives]

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．

[Course schedule and contents]

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と、周期性／孤立性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を説明する。
結晶構造・相図（3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。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。
エネルギーバンド（2回）：固体物性（エネルギーバンド）、励起順位間の遷移を利用する分光研究
燃材料（5回）：固体物性（半導体、金属、超伝導）を説明し、フォノンの基礎とこれが関わる熱容量と熱伝導を説明する。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。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。
磁性（3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）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。

[Course requirements]

None

Continue to 核燃料サイクル工学2(2)↓↓↓

核燃料サイクル工学2(2)

[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.

未更新

Course number	G-ENG08 7C017 LJ57

Course title (and course title in English)	放射線物理工学 Radiation Physics and Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANNO IKUO

Target year		Number of credits	2	Year/semesters	2021/First semester

Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,5times,
,2times,
,2times,
,2times,
,1time,

[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.

Course number	G-ENG08 5C018 LJ57		
Course title (and course title in English)	中性子科学 Neutron Science	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,TASAKI SEIJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

中性子散乱、中性子の応用の論文を読み、その内容を分かりやすく紹介する。
英語論文を読み取ることに習熟するとともに、分かりやすいプレゼンテーションの方法の取得も目的とする。

[Course objectives]

基礎科学から応用まで広く使われている中性子の適用例について学ぶ。
英語論文を読み、内容を理解した上で、分かりやすく紹介するスキルを磨く。

[Course schedule and contents]

第01回 中性子科学とは
第02回～第08回 中性子源、中性子散乱理論、中性子散乱実験に用いるデバイス等、基礎的な中性子散乱研究に関する英語教科書の輪読
第09回～第14回 中性子を用いた種々の技法、中性子干渉、ラジオグラフィ、物性研究など中性子を用いた研究に関する論文の輪講
第15回 学習到達度の評価
第16回 フィードバック

[Course requirements]

None

[Evaluation methods and policy]

論文等の内容をまとめた発表および期末に課されるレポートの内容を以って採点する。

[Textbooks]

発表で使う資料はあらかじめ配布する。

[References, etc.]

（Reference books）
I. I. Gurevich and L. V. Tarasov 『Low Energy Neutron Physics』（North Holland Publishing Co.）ISBN: 0720401348
その他必要に応じて授業中に紹介する

[Study outside of class (preparation and review)]

自分の担当部分の内容について事前によく調査すること。教員に質問に来るのもよい。

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG08 7C034 LJ28		
Course title (and course title in English)	核エネルギー変換工学 Nuclear Energy Conversion and Reactor Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KAWARA ZENSAKU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,3times,
,2times,
,3times,
,2times,
,4times,

[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.

未更新

Course number	G-ENG08 7C037 LJ28

Course title (and course title in English)	混相流工学 Multiphase Flow Engineering and Its Application	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YOKOMINE TAKEHIKO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

What#039s the multiphase flows?,1time,To review the definitions and fundamental characteristics of multiphase flows.
Governing equation of gas-liquid two phase flows,2times,To learn the governing equation of gas-liquid two phase flows
Modeling of gas-liquid two phase flows,2times,To learn modeling of gas-liquid two phase flows and its constitutive equations
Numerical methods,3times,To learn the numerical methods to solve the single-phase and two-phase flows
Examples of gas-liquid two phase flow analysis,1time,To show some examples of gas-liquid two phase flow analysis
Characteristics of particle flows,1time,Review characteristics of particle flows
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.
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.
Measurements of particle characteristics,2times,Review several measuring methods of particle characteristics and thermofluid behaviors

[Course requirements]

None

Continue to 混相流工学(2)↓↓↓

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.

未更新

Course number	G-ENG08 7C038 LJ28		
Course title (and course title in English)	核融合プラズマ工学 Physics of Fusion Plasmas	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,2times,
,2times,
,1time,
,1time,
,3times,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

Course number	G-ENG08 7C047 LJ68		
Course title (and course title in English)	放射線医学物理学 Medical Physics	Instructor's name, job title, and department of affiliation	Institute for Integrated Radiation and Nuclear Science Associate Professor,SAKURAI YOSHINORI Institute for Integrated Radiation and Nuclear Science Associate Professor,TANAKA HIROKI Institute for Integrated Radiation and Nuclear Science Assistant Professor,TAKATA, Takushi

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 ldquopromotion for the advance of radiation therapyrdquo and ldquoquality assurance for radiation therapyrdquo. 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.

[Course objectives]

To learn the fundamental knowledge of medical physics, mainly for radiation physics in diagnosis and therapy

[Course schedule and contents]

Introduction to medical physics for radiation,1time,
Fundamental bilology 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,

[Course requirements]

It is recommended to attend the course, ldquoRadiation Measurement for Medicinerdquo, concurrently.

[Evaluation methods and policy]

Attendance and reports

[Textbooks]

Not specified. Handouts will be given for each topic.

[References, etc.]

（Reference books）

F.M.Khan, ldquoThe Physics of Radiation Therapy: Mechanisms, Diagnosis, and Managementrdquo (Lippincott Williams amp Wilkins, Baltimore, 2003)

[Study outside of class (preparation and review)]

Review the rudiments for radiation physics and radiation measurement.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG08 6C050 PJ77

Course title (and course title in English)	インターンシップM（原子核） Engineering Internship M	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester

Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,,

[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.

未更新

Course number	G-ENG08 7C063 EJ28		
Course title (and course title in English)	原子核工学特別実験及演習第一 Experiments and Exercises on Nuclear Engineering, Adv.I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,
,6times,
,10times,

[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.

未更新

Course number	G-ENG08 7C064 EJ28		
Course title (and course title in English)	原子核工学特別実験及演習第二 Experiments and Exercises on Nuclear Engineering, Adv.II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,
,6times,
,10times,

[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.

未更新

Course number	G-ENG08 7C068 SJ28		
Course title (and course title in English)	原子力工学応用実験 Nuclear Engineering Application Experiments	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Institute for Integrated Radiation and Nuclear Science Associate Professor,YAMAMOTO TOSHIHIRO

Target year		Number of credits	2	Year/semesters	2021/Year-round
Days and periods	Mon.4,5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,10times,

[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.

未更新

Course number	G-ENG08 5C070 LJ53		
Course title (and course title in English)	基礎量子科学 Introduction to Quantum Science	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SAITOU MANABU Graduate School of Engineering Associate Professor,MAJIMA TAKUYA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,9times,
,2times,
,3times,
,1time,

[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.

未更新

Course number	G-ENG08 5C072 LJ28		
Course title (and course title in English)	基礎量子エネルギー工学 Introduction to Advanced Nuclear Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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

[Course requirements]

None

[Evaluation methods and policy]

The attendance score (50) and the grade (50) for the assignment at the time of the lecture are comprehensively evaluated.

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Instruct during class.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG08 5C074 LJ53		
Course title (and course title in English)	量子科学 Quantum Science	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUO JIROU Graduate School of Engineering Associate Professor,MAJIMA TAKUYA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

To provide students to understand fundamental interactions in quantum science.

[Course schedule and contents]

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.

[Course requirements]

Solid state physics, Quantum mechanics(beginnerrsquos), Electromagnetism

[Evaluation methods and policy]

Coursework will be evaluated with attendance and report on subjects.

[Textbooks]

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.

未更新

Course number	G-ENG08 5C076 LE28		
Course title (and course title in English)	基礎電磁流体力学 Fundamentals of Magnetohydrodynamics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI Graduate School of Engineering Professor,YOKOMINE TAKEHIKO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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

[Course requirements]

Fundamental fluid dynamics and electromagnetics should be learned prior to attend this lecture.

[Evaluation methods and policy]

Attendance and two reports

[Textbooks]

Handout of the presentation will be provided at the lecture

[References, etc.]

（Reference books）

P. A. Davidson, ldquoAn Introduction to Magnetohydrodynamics,rdquoCambridge texts in applied mathematics, Cambridge University Press, 2001

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG08 7C078 LJ53

Course title (and course title in English)	複合加速器工学 Advanced Accelerator Technology	Instructor's name, job title, and department of affiliation	Institute for Integrated Radiation and Nuclear Science Associate Professor,YOSHIHIRO　ISHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

This lecture aims to learn a basic accelerator theory and to attain abilities to make a primitive design of circular accelerator.

[Course schedule and contents]

Hisitory 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,

[Course requirements]

None

[Evaluation methods and policy]

Reports on practical issues and subjects.

[Textbooks]

Not used

[References, etc.]

（Reference books）

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).

[Study outside of class (preparation and review)]

特になし

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG08 7C080 LJ28

Course title (and course title in English)	原子炉安全工学 Nuclear Reactor Safety Engineering	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,4times,
,3times,
,5times,
,1time,
,1time,

[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.

Course number	G-ENG08 7C082 LJ52		
Course title (and course title in English)	応用中性子工学 Applied Neutron Engineering	Instructor's name, job title, and department of affiliation	Institute for Integrated Radiation and Nuclear Science Associate Professor,HINO MASAHIRO Institute for Integrated Radiation and Nuclear Science Associate Professor,CHATAKE TOSHIYUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

・To understand generation of low-energy neutrons and their application.

[Course schedule and contents]

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.

[Course requirements]

None

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.

未更新

Course number	G-ENG08 6C084 LJ28		
Course title (and course title in English)	原子核工学最前線 Nuclear Engineering, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,TSUCHIDA HIDETSUGU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,13times,
,2times,

[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.

Course number	G-ENG08 9C086 LJ28		
Course title (and course title in English)	**原子核工学序論 1** Introduction to Nuclear Engineering 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Introduction to Radiation 1

1) Discovery of radiation
2) History of radiation
3) Basics of radiation
4) Interaction with substances
5) Detection of radiation
6) Generation of radiation
7) Industrial uses of radiation

Energy generation and utilization 1

8) Energy situation and nuclear power
9) Basics of reactor physics
10) Reactor control
11) Reactor selection-present
12) Reactor selection-past
13) Reactor selection-next generation reactor
14) Viewpoints on nuclear energy utilization and development
15) Feedback; confirmation of learning achievement

Continue to 原子核工学序論 1 (2)↓↓↓

原子核工学序論１(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.)）

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.

未更新

Course number	G-ENG08 9C087 LJ28		
Course title (and course title in English)	原子核工学序論２ Introduction to Nuclear Engineering 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Introduction to Radiation 2

1) Radiation biology
2) Medical application of radiation
3) Effects of radiation on the human body
4) Safe use of radiation
5) Radiation-related laws and regulations

New developments in quantum theory
6) Cutting-edge information technology

Energy generation and utilization 2
7) History and fundamentals of nuclear fusion
8) Fusion reactor development
9) Power reactor systems
10) Ensuring safety
11) Technical ethics
12) Radiation in the environment
13) Nuclear fuel cycle
14) Reprocessing and geological disposal
15) Feedback; confirmation of learning achievement

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.

未更新

Course number	G-ENG08 7C089 SJ28		
Course title (and course title in English)	原子核工学セミナーA Seminar on Nuclear Engineering A, B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,10times,
,2times,

[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.

未更新

Course number	G-ENG08 7C090 SJ28		
Course title (and course title in English)	原子核工学セミナーB Seminar on Nuclear Engineering A, B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,10times,
,2times,

[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.

未更新

Course number	G-ENG38 7R001 LJ53				
Course title (and course title in English)	量子ビーム科学特論 Quantum Beam Science, Adv.		Instructor's name, job title, and department of affiliation	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	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

, 6 times,
, 4 times,
, 2 times,
, 2 times,
, 1 times,

[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.

未更新

Course number	G-ENG38 5R004 LJ57		
Course title (and course title in English)	量子物理学特論 Quantum Physics, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MIYADERA TAKAYUKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Keywords: Foundations of quantum theory, quantum information theory.

[Course objectives]

To understand recent progress of the quantum foundations.

[Course schedule and contents]

Quantum theories and their applications (14times)
We study a relevant textbook and related topics.
Confirmation of achievement in study,1time,

[Course requirements]

quantum physics

[Evaluation methods and policy]

Presentations and discussions

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Each participant is required to read papers in advance.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG38 7R013 LE59		
Course title (and course title in English)	非線形プラズマ工学 Nonlinear Physics of Fusion Plasma	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURAKAMI SADAYOSHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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

[Course objectives]

[Course schedule and contents]

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

[Course requirements]

Plasma Physics, Fundamental Magnetohydrodynamics, Fusion Plasma Physics, or equivalents

[Evaluation methods and policy]

Report in English

Continue to 非線形プラズマ工学(2)↓↓↓

非線形プラズマ工学(2)

[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.

未更新

Course number	G-ENG38 7R017 PB77		
Course title (and course title in English)	インターンシップD（原子核） Engineering Internship D	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,,

[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.

未更新

Course number	G-ENG38 7R019 SB28		
Course title (and course title in English)	原子核工学特別セミナーA Seminar on Nuclear Engineering, Adv. A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,10times,
,2times,

[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.

未更新

Course number	G-ENG38 7R021 SB28		
Course title (and course title in English)	原子核工学特別セミナーB Seminar on Nuclear Engineering, Adv. B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,10times,
,2times,

[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.

未更新

Course number	G-ENG38 7R023 SB28		
Course title (and course title in English)	原子核工学特別セミナーC Seminar on Nuclear Engineering, Adv. C	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,10times,
,2times,

[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.

未更新

Course number	G-ENG38 7R025 SB28		
Course title (and course title in English)	原子核工学特別セミナーD Seminar on Nuclear Engineering, Adv. D	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,10times,
,2times,

[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.

未更新

Course number	G-ENG38 7R027 SB28		
Course title (and course title in English)	原子核工学特別セミナーE Seminar on Nuclear Engineering, Adv. E	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,10times,
,2times,

[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.

未更新

Course number	G-ENG38 7R029 SB28		
Course title (and course title in English)	原子核工学特別セミナーF Seminar on Nuclear Engineering, Adv. F	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SASAKI TAKAYUKI Graduate School of Engineering Associate Professor,MATSUO JIROU

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,10times,
,2times,

[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.

未更新

Course number	G-ENG08 7W620 LJ52		
Course title (and course title in English)	医学放射線計測学 Radiation Measurement for Medicine	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,TSUCHIDA HIDETSUGU Institute for Integrated Radiation and Nuclear Science Associate Professor,SAKURAI YOSHINORI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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,

[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.

未更新

Course number	G-ENG09 5C209 LJ75		
Course title (and course title in English)	**非鉄製錬学特論** Non-ferrous extractive metallurgy, Adv.	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,1time,
,1time,
,2times,
,1time,
, **1** times,
,2times,
,1time,
,2times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

未更新

Course number	G-ENG09 5C212 LJ75				
Course title (and course title in English)	物質情報工学 Materials Informatics		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWAI JIYUN	
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Fourier transform of physical data, data processing such as smoothing, ISO standard of analysis, detection limit, and error will be discussed.

[Course objectives]

Learn how to obtain materials information from data measured for your graduate research.

[Course schedule and contents]

Central limit theorem (Cental 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 ensamble (Probability and Laplace transform)---1

Green function and density matrix (Aimilarity between Schroedinger equation and diffusion equation)---2

JIS and ISO standards---1

Materials informatics---1

Feedback---1

Continue to 物質情報工学(2)↓↓↓

物質情報工学(2)

[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.

未更新

Course number	G-ENG09 5C214 LJ75		
Course title (and course title in English)	**凝固・結晶成長学** Microstructure,solidification and crystal growth	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,NOSE YOSHITAROU Graduate School of Engineering Professor,HIDEYUKI YASUDA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

(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】

[Course requirements]

It is desirable to have learned thermodynamics, transport phenomena, microstructures in materials, and corresponding subjects, but it is not necessary.

[Evaluation methods and policy]

Evaluation will be based on reports and attend.

[Textbooks]

Utilizing resumes provided in the lecture.

[References, etc.]

（Reference books）
Introduced during class

[Study outside of class (preparation and review)]

To review contents in the last time before the lecture.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG09 7C240 EJ75		
Course title (and course title in English)	材料工学特別実験及演習第一 Laboratory & Seminar in Materials Science and Engineering, Adv. I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,10times,

[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.

未更新

Course number	G-ENG09 7C241 EJ75				
Course title (and course title in English)	材料工学特別実験及演習第二 Laboratory & Seminar in Materials Science and Engineering, Adv. II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO		
Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,10times,

[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.

未更新

Course number	G-ENG09 7C251 SJ75		
Course title (and course title in English)	材料工学セミナーA Seminar on Materials Science and Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,12times,
,1time,

[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.

未更新

Course number	G-ENG09 7C253 SJ75		
Course title (and course title in English)	材料工学セミナーB Seminar on Materials Science and Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,12times,
,1time,

[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.

Course number	G-ENG09 5C263 LJ75		
Course title (and course title in English)	結晶物性学特論 Physical Properies of Crystals Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,INUI HARUYUKI Graduate School of Engineering Associate Professor,KISHIDA KIYOUSUKE

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Various physical properties of crystalline materials are strongly affected by their crystal symmtery and also by thier 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.

[Course objectives]

This class aims to help students to acquire fundamentals to control various properties of crystalline materials through understandig the influences of crystal symmetry on various properties of crystalline materials.

[Course schedule and contents]

Week 1: Basic theory of elasticity
Weak 2: Yield criteria and plastic deformation of single crystals
Weak 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

[Course requirements]

None

[Evaluation methods and policy]

Evaluation will be based on individual reports.

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.

Course number	G-ENG09 5C267 LJ75　G-ENG09 6C267 LJ75		
Course title (and course title in English)	**セラミックス材料学** Ceramic Materials Science	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TANAKA ISAO Graduate School of Engineering Associate Professor,SEKO ATSUTO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Systematic understanding of the properties of ceramics on macroscopic and microscopic scales and learning approaches to the issues in ceramic research.

[Course schedule and contents]

Introduction to ceramics,2times,Overview of the history and commercial applications of ceramics.
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.
Structural ceramics,2times,Mechanical properties of ceramics.
Energy ceramics,2times,Ceramics for energy applications and their understanding from the viewpoint of the atomic and electronic structure.
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.
Assessment of mastery of the course content,1time,The mastery of the course content is assessed.

[Course requirements]

None

[Evaluation methods and policy]

Evaluations are made based on the examination or reports.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Carter, C. Barry et al. 『Ceramic Materials』（Springer, 2013）ISBN:9781461435228（Some Figures and Tables in this book will be explained during the lecture. ）

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.

未更新

Course number	G-ENG09 5C271 LJ75		
Course title (and course title in English)	磁性物理 Magnetism and Magnetic Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NAKAMURA HIROYUKI Graduate School of Engineering Associate Professor,TABATA YOSHIKAZU

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Fundamental magnetism of condensed matters and application of magnetic materials are lectured.

[Course objectives]

Systematic understanding of magnetic properties of condensed matters and learning application of magnetic materials

[Course schedule and contents]

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 permanet 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 statiscal 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 statiscal physics.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG09 7C273 LJ75		
Course title (and course title in English)	社会基盤材料特論 I Advanced Materials Science & Engineering in industries I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

Continue to 社会基盤材料特論 I (2)↓↓↓

社会基盤材料特論 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.

未更新

Course number	G-ENG09 7C275 LJ75				
Course title (and course title in English)	社会基盤材料特論II Advanced Materials Science & Engineering in industries II		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO	
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

Continue to 社会基盤材料特論II(2)↓↓↓

社会基盤材料特論 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.

未更新

Course number	G-ENG09 8C277 PJ75		
Course title (and course title in English)	インターンシップM（材料工学） Internship in Materials Science & Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURASE KUNIAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,13times,
,1time,

[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.

未更新

Course number	G-ENG09 5C286 LJ75		
Course title (and course title in English)	原子分子工学特論 Atomic-molecular scale engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIMURA HIROYUKI Graduate School of Engineering Associate Professor,KUROKAWA SHIYUU Graduate School of Engineering Associate Professor,ICHII TAKASHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,4times,
,5times,
,5times,

[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.

未更新

Course number	G-ENG09 5C288 LJ75		
Course title (and course title in English)	材料組織・構造評価学 Microstructure theory and structure evaluation	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OKUDA HIROSHI Graduate School of Engineering Associate Professor,YUGE KORETAKA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,3times,
,3times,
,2times,
,4times,

[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.

未更新

Course number	G-ENG09 5C290 LJ75		
Course title (and course title in English)	材料電気化学特論 Electrochemistry for Materials Processing, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURASE KUNIAKI Graduate School of Engineering Associate Professor,FUKAMI KAZUHIRO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

Modern electroplating,4times,
Thermodynamics of electrodeposition,2times,
Corrosion engineering and anodization,4times,
Semiconductor electrochemistry,2times,
Advanced materials electrochemistry,2times,
Self-assessment of achievement,1time,

[Course requirements]

Knowledge of fundamental electrochemistry and chemical thermodynamics are required.

[Evaluation methods and policy]

[Textbooks]

No textbook is required for this course.

[References, etc.]

（Reference books）

（Related URLs）

(Not available)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Not available

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG39 7R241 SJ75		
Course title (and course title in English)	材料工学特別セミナーA Seminar on Materials Science and Engineering, Adv.A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,12times,
,1time,

[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.

未更新

Course number	G-ENG39 7R242 SJ75		
Course title (and course title in English)	材料工学特別セミナーB Seminar on Materials Science and Engineering, Adv.B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,12times,
,1time,

[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.

未更新

Course number	G-ENG39 7R243 SJ75		
Course title (and course title in English)	材料工学特別セミナーC Seminar on Materials Science and Engineering, Adv.C	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,12times,
,1time,

[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.

未更新

Course number	G-ENG39 7R244 SJ75		
Course title (and course title in English)	材料工学特別セミナーD Seminar on Materials Science and Engineering, Adv.D	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,12times,
,1time,

[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.

未更新

Course number	G-ENG39 7R245 SJ75		
Course title (and course title in English)	材料工学特別セミナーE Seminar on Materials Science and Engineering, Adv. E	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,12times,
,1time,

[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.

未更新

Course number	G-ENG39 7R247 SJ75		
Course title (and course title in English)	材料工学特別セミナーF Seminar on Materials Science and Engineering, Adv.F	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUJI NOBUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,12times,
,1time,

[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.

Course number	G-ENG10 7C601 LB72				
Course title (and course title in English)	電気数学特論 Applied Mathematics for Electrical Engineering, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,DOI SHINJI Graduate School of Engineering Professor,HIKIHARA TAKASHI		
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.1	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

In the class, fundamental mathematics is lectured for electrical engineering, electronics, system engineering, and material science. In particular, system theory, nonlinear dynamics, and particle dynamics in force field can be discussed with mathematical clear image.

[Course objectives]

Professors expect students to model their system and analyze the models theoretically. Students will be requested to understand their system in principle mechanics and control them based on system theory.

[Course schedule and contents]

Introduction 1 (1 class)
Several examples of linear operators encountered in electrical engineering, e.g. in quantum mechanics are explained. Then, Linear vector space is reviewed and linear dynamical system is introduced.
Fundamentals of linear vector space (2-4 classes)
Direct sum decomposition, projection operator, and the structure of vector spaces such as Jordan normal form are explained.
Linear dynamical system (3-5 classes)
On the basis of the knowledge of the vector space, linear dynamical systems theory is explained as a simple application of vector spaces.
Introduction of nonlinear system (1 class)
Linearization of the nonlinear dynamical system and eigenspace (1-2 classes)
Hamiltonian and analysis (2 classes)
Manifold and vector field (2-3 classes)

[Course requirements]

Linear algebra

[Evaluation methods and policy]

Students are requested to reply to report assignments. The grading is based on the evaluation of the reports.

Continue to 電気数学特論 (2)↓↓↓

電気数学特論 (2)

[Textbooks]

Not used

[References, etc.]

（Reference books）

S. Wiggins 『Introduction to Applied Nonlinear Dynamical Systems and Chaos』 （Springer-Verlag）

[Study outside of class (preparation and review)]

https://www.t.kyoto-u.ac.jp/lecturenotes/gse/kueeng/10C601/syllabus

（Other information (office hours, etc.)）

Appropriate references will be shown in classes. The 1st class is due from April 8th, 2021.

*Please visit KULASIS to find out about office hours.

Course number	G-ENG10 5C604 LJ72		
Course title (and course title in English)	応用システム理論 Applied Systems Theory	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Associate Professor,TANAKA SHIYUNJI Graduate School of Engineering Associate Professor,SAKAMOTO TAKUYA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

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. Gendreu 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.

未更新

Course number	G-ENG10 5C610 LJ72		
Course title (and course title in English)	電磁気学特論 Electromagnetic Theory, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUO TETSUJI Graduate School of Engineering Senior Lecturer,MIFUNE TAKESHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

The first half: the special theory of relativity and the covariance of Maxwell's equations
The latter half: theory and methods of computational electromagnetics

[Course objectives]

1. Understanding of the basic concepts of special theory of relativity and the covariant formulation of Maxwell#039s equations
2. Understanding of the basics of computational electromagnetics

[Course schedule and contents]

Introduction to special theory of relativity: 2-3times
- Galilean relativity and special relativity
- Lorentz transformation

Tensor representation and relativistic dynamics: 2-3times
- Introduction to tensor representation
- Relativistic dynamics

Covariant formulation of Maxwell's equations: 2-3times
- Electromagnetic field tensor
- Lorentz covariance of Maxwellrsquos equations

Foundations of computational electromagnetics: 1-2times
- Introduction to computatinal electromagnetics

Theory and methods in computational electromagnetics: 3-4times
- Methods in computational electromagnetics, e.g., finite element method

Matrix computations in computational electromagnetics: 1-2times
- Basics and state-of-the-art of matrix computations in computational electromagnetics

[Course requirements]

Basic electromagnetic theory

[Evaluation methods and policy]

Submission of reports (twice)

Continue to 電磁気学特論(2)↓↓↓

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.

未更新

Course number	G-ENG10 5C611 LE72		
Course title (and course title in English)	電磁界シミュレーション Computer Simulation of Electrodynamics	Instructor's name, job title, and department of affiliation	Research Institute for Sustainable Humanosphere Professor,OOMURA YOSHIHARU Research Institute for Sustainable Humanosphere Associate Professor,EBIHARA YUUSUKE

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

Variables and Classification of Simulation Codes,1time,
Finite Difference Methods,1time,
Difference Form of Maxwell#039s 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,
Interporation of Electromagnetic Field,1time,
Computatin of Charge and Current Densities, Self-force Cancellation,1time,
Initilization 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,

[Course requirements]

Electrodynamics, Vector Analysis, Computer Language

[Evaluation methods and policy]

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.

未更新

Course number	G-ENG10 5C612 LB72				
Course title (and course title in English)	宇宙電波工学 Space Radio Engineering		Instructor's name, job title, and department of affiliation	Research Institute for Sustainable Humanosphere Professor,KOJIMA HIROTSUGU	
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

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 provides the design of onboard components such as power, communication, and attitude control systems.

[Course objectives]

Mastery of the way how we can make use of the knowledges of the physics and technology to the space engineering.

[Course schedule and contents]

Space environment and its impacts to spacecraft design,5-6times,
The space environment and its impacts to the design of spacecraft in the view point of spacecraft design such as radiations, plasma, and spacecraft charging.

Power,2times,Power source and system on board spacecraft.

Electromagnetic Compatibility of spacecraft,1time,Electromagnetic Compatibility in the view point of spacecraft designs

Thermal design of spacecraft,1-2times,Introduction of the thermal design of spacecraft systems to keep proper temperatures inside spacecraft in space.

Communication and commands,2times,Communication system between Earth and spacecraft including command/House Keeping system.

Attitude control system, 1 times,Introduction of attitude control systems of spacecraft.

History of rockets,1time,History of the development of rockets.
Feedback,1time,Questions are accepted via e-mails during the feedback week.

[Course requirements]

Plasma physics, Electromagnetics. Radio engineering, Electronics

Continue to 宇宙電波工学(2)↓↓↓

宇宙電波工学(2)

[Evaluation methods and policy]

11 or more times attendances in lectures are mandatory. The grade is evaluated considering attendance and final examination. The ratio for the evaluation is 4:6.

[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.

未更新

Course number	G-ENG10 5C613 LB72		
Course title (and course title in English)	超伝導工学 Superconductivity Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Program-Specific Professor,NAKAMURA TAKETSUNE Graduate School of Engineering Professor,AMEMIYA NAOYUKI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.4	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

See Japanese version

[Course objectives]

See Japanese version

[Course schedule and contents]

This class is in English.

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。

（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。

（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。

（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。

（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。

（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。

（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。

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 runway 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 『超電導工学』

[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.

Course number	G-ENG10 5C614 LJ72		
Course title (and course title in English)	生体機能工学 Biological Function Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOBAYASHI TETSUO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

The course provides basic knowledge of biological function engineering, in particular, human brain functions.

[Course objectives]

To understand basic knowledge of neuroimaging techniques and human brain functions.

[Course schedule and contents]

Basics of nervous system,2times,Study about detail structure of the human brain to understand higher brain functions. In particular, learn about cortical structure and functional map.
Neurones and glial cells,1time,Study about detail structures and functions of neuron and glial cells.
Neuroimaging techniques,3times,Study about measurement principles and analytical methods of representative non-invasive neuro-imaging techniques.
Sensory functions,2times,Study about organizations of sensory systems such as visual, auditory and somatosensory systems.
Motor functions,1time,Study about organizations and functions of primary motor, premotor and supplementary motor areas.
Magnetic Resonance Imaging and its Application,3times,Study about basic principle and pulse sequences of magnetic resonance imaging (MRI) and its application.
Practice of MRI,2times,Practice of MRI acquisition of the head as well as image processing of the MRI data.
Evaluation of understanding,1time,We are going to check students#039 achievement by answering questions from students.

[Course requirements]

Electricity and magnetism, Fundamentals of biomedical engineering

[Evaluation methods and policy]

A report is given in the class for evaluating the level of understanding of the fundamentals of biological function engineering. Rating is based on the comprehensive evaluation of the reports.

Continue to 生体機能工学(2)↓↓↓

生体機能工学(2)

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class
e.g.,
Tetsuo Kobayashi, Isamu Ozaki and Ken Nagata (eds.): Brain topography and multimodal imaging, (Kyoto Univ. Press, 2009)

[Study outside of class (preparation and review)]

Review handouts provided in the class or materials uploaded on a webpage in KULASIS.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG10 5C617 LJ72		
Course title (and course title in English)	マイクロ波応用工学 Applied Microwave Engineering	Instructor's name, job title, and department of affiliation	Research Institute for Sustainable Humanosphere Professor,SHINOHARA NAOKI Research Institute for Sustainable Humanosphere Associate Professor,MITANI TOMOHIKO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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 resonnance coupling, energy harvesting, and applied microwave technologies of microwave processing, wireless communications, and radar.

[Course objectives]

Students learn about applied microwave engeering, mainly microwave power transmission.

[Course schedule and contents]

Introduction,1time,The purpose and constitution of the lecture, and review of microwave engineering are explained.
Applications of Wireless Power Tramsmission,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 interation 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.

[Course requirements]

Microwave engineering

[Evaluation methods and policy]

Reports

[Textbooks]

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)

[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.

未更新

Course number	G-ENG10 5C625 LB72		
Course title (and course title in English)	電気回路特論 Theory of Electric Circuits, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,HISAKADO TAKASHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

Introduction,1time,
Modeling by circuit,4times,
Circuit equation,4times,
Phenomena in circuit,3times,
Property of circuit,2times,
Achievement test,1time,

[Course requirements]

None

[Evaluation methods and policy]

Reports

[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.

未更新

Course number	G-ENG10 6C627 PB72		
Course title (and course title in English)	研究インターンシップM（電気） Research Internship(M)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,,

[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.

未更新

Course number	G-ENG10 5C628 LB72

Course title (and course title in English)	状態方程式論 State Space Theory of Dynamical Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI Graduate School of Engineering Senior Lecturer,HOSOE YOUHEI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

Classical control theory (in terms of transfer functions), linear algebra and calculus.

[Evaluation methods and policy]

The grading will be based on the exam.

Continue to 状態方程式論(2)↓↓↓

状態方程式論(2)

[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.

未更新

Course number	G-ENG10 5C631 LB72		
Course title (and course title in English)	制御系設計理論 Design of Control Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI Graduate School of Engineering Senior Lecturer,HOSOE YOUHEI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

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.

未更新

Course number	G-ENG10 6C643 SB72		
Course title (and course title in English)	電気工学特別実験及演習１ Advanced Experiments and Exercises in Electrical Engineering I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG10 6C646 SB72		
Course title (and course title in English)	電気工学特別実験及演習２ Advanced Experiments and Exercises in Electrical Engineering II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG10 5C647 LJ72		
Course title (and course title in English)	電気電磁回路論 Electrical and Electromagnetic Circuits	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

Materials for this course will be distributed at the lectures.

[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.

Course number	G-ENG10 5C714 LB72		
Course title (and course title in English)	時空間メディア解析特論 Spacio-tempral Data Analysis for Multimedia	Instructor's name, job title, and department of affiliation	Academic Center for Computing and Media Studies Professor,NAKAMURA YUUICHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

Representation, feature extraction, recognition of media with two or higher dimensions, especially images and videos, are explained with comparing to human vision and biological systems.

[Course objectives]

To learn the basic of representation, feature extraction, and pattern recognition of signals with two or higher dimension, and their applications.

[Course schedule and contents]

Spatio-Temporal Media,1time,What is spatio-temporal media. Some examples.
Light and Colors,1-2times,Intensity, colors, and spectrum in image media.
Features and Segmentation,2times,Features such as edge, region, etc. for analysing image media.
Filtering and Wavelet Transform,1-2times,Introduction to filtering and Wavelet Transform.
Discrete Wavelet Transform and Applications,1-2times,Dicrete Wavelet Transform and applications such as image enhancement, image compression, etc.
Geometry of Image Capturing,1-2times,The mechanism and geometry of image capturing: projection of a 3D world into 2D images.
3D Measurements and Reconstruction,2times,3D measurements and 3D world reconstrunction from a set of 2D images.
Measurement of Motions,1-2times,Motion detection and measurement, and oject tracking.
Pattern Recognition,0-2times,The basic idea of pattern recognition and usuful tools such as Support Vector Machine, Deep Neural Network, Convolutional Neural Network.

[Course requirements]

Fundamental knowledge of digital signal processing

[Evaluation methods and policy]

Evaluation is based on participation and reports.

[Textbooks]

No specific textbooks. Handouts will be given when necessary.

[References, etc.]

（Reference books）

Computer Vision: A Modern Approach, Forsyth and Ponce, Prentice Hall

Continue to 時空間メディア解析特論(2)↓↓↓

時空間メディア解析特論(2)

（Related URLs）

(Please see PandA (https://panda.ecs.kyoto-u.ac.jp/portal).)

[Study outside of class (preparation and review)]

It is preferable to have fundamental knowledge of digital signal processing.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG10 5C718 PJ72				
Course title (and course title in English)	電気工学特別研修１(インターン) Advanced Seminar in Electrical EngineeringI		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3,4,Fri.3,4	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,6times,

[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.

未更新

Course number	G-ENG10 5C720 PJ72				
Course title (and course title in English)	電気工学特別研修２(インターン) Advanced Seminar in Electrical EngineeringII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN		
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3,4,Fri.3,4	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,6times,

[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.

未更新

Course number	G-ENG11 5C800 LB52		
Course title (and course title in English)	半導体ナノスピントロニクス Semiconductor Nanospintronics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SHIRAISHI MASASHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

Understanding basic physics of spin transport, spin current and spin-orbit coupling. Mastering calculation skills related with these topics.

[Course schedule and contents]

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.
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.
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.
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.

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.

未更新

Course number	G-ENG10 7K010 SE72　G-ENG11 7K010 SE72		
Course title (and course title in English)	先端電気電子工学通論 Recent Advances in Electrical and Electronic Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,6times,
,9times,

[Course requirements]

None

[Evaluation methods and policy]

The evaluation of a studentrsquos work is given based on his/her attendance, reports and discussions, not on examinations.

[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.

未更新

Course number	G-ENG40 7R610 SB72				
Course title (and course title in English)	電気工学特別セミナー Advanced Electrical Engineering Seminar		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN	
Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG40 7R630 PB72

Course title (and course title in English)	研究インターンシップD（電気） Research Internship (D)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,,

[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.

未更新

Course number	G-ENG40 7R632 SB72		
Course title (and course title in English)	電気工学特別演習1 Advanced Exercises on Electrical Engineering I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG40 7R633 SB72		
Course title (and course title in English)	電気工学特別演習2 Advanced Exercises on Electrical Engineering II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,WADA OSAMI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG11 6C710 SB72				
Course title (and course title in English)	電子工学特別実験及演習１ Advanced Experiments and Exercises in Electronic Science and Engineering I		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN	
Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG11 6C713 SB72		
Course title (and course title in English)	電子工学特別実験及演習２ Advanced Experiments and Exercises in Electronic Science and Engineering II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

Course number	G-ENG11 5C801 LJ72		
Course title (and course title in English)	電子装置特論 Charged Particle Beam Apparatus	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,GOTOU YASUHITO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

[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.

[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.

[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.

[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.

[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.

[Fundamentals of vacuum engineering] Once
Fundamentals of vacuum engineering is given. Several pumps used for ion beam systems are also introduced.

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]

Yasuhito Gotoh, Charged Particle Beam Apparatus, Reiwa 3rd version (to be sold at CO-OP shop in Katsura Campus)

[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.

Course number	G-ENG11 5C803 LB72		
Course title (and course title in English)	量子情報科学 Quantum Information Science	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering Associate Professor,OKAMOTO RYOU Graduate School of Engineering Associate Professor,ETO YUJIRO Graduate School of Engineering Assistant Professor,TAKASHIMA HIDEAKI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Introduction, 3 times,
First, we outline the whole lecture and then explain basic concepts such as quantum bit, quantum gate, quantum entanglement etc.

Quantum Computer (Theory), 3 times,
On quantum computation, various quantum algorithms are discussed.

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.

Quantum Key distribution and Quantum metrology,4 times,
Describe the basic concept of quantum cryptography and quantum measurements and their recent research trends.

Summary and Outlook, 2 times,
In addition to summarizing the whole, if time permits, discuss the problems of quantum information science and ethics.

[Course requirements]

Basic understanding of quantum mechanics will be helpful.

[Evaluation methods and policy]

Comprehensive evaluation based on normal points (25 points) and reports (3 times, 25 points each).
・In principle, if you miss four or more classes, you will be rejected.

Continue to 量子情報科学(2)↓↓↓

量子情報科学(2)

・ Reports must be submitted all times.
Give high points for those that show their own ingenuity.

[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 lectureb 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.

未更新

Course number	G-ENG11 5C810 LJ72

Course title (and course title in English)	半導体工学特論 Semiconductor Engineering, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KIMOTO TSUNENOBU

Target year		Number of credits	2	Year/semesters	2021/First semester

Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

This course explores the fundamentals of semiconductor physics and engineering, which are esseantial to understand semiconductor materials and devices.

[Course objectives]

[Course schedule and contents]

Band theory,2-3times,Electronic band structures are discussed. Nearly free electron and tight-binding approachs are explained. Band structures of major semiconductors such as Si and GaAs are also discussed.
Carrier transport and scattering,3-4times,Carrier transport and electrical conduction are explained by using the Boltzmann transport equation. Scattering mechanism of carriers and mobility are discussed.
High-field effect,2-3times,Drift of carriers and junction breakdown under high electric field are discussed. A few phenomena under high magnetic field are also explained.
Defects in semiconductors,1-2times,Crystallographic and electronic properties of defects (both extended and point defects) in a semiconductor are explained.
MOS physics,2-3times,Energy band diagrams and carrier statistics in a metal/insulator/semiconductor (MIS) structure are discussed.

[Course requirements]

Semiconductor engineering, quantum mechanics (undergraduate level)

[Evaluation methods and policy]

Final examination and a few reports

[Textbooks]

No textbook is assigned.

[References, etc.]

（Reference books）

S. M. Sze Physics of Semiconductor Devices (Wiley Interscience) P.Y.Yu and M. Cardona Fundamentals of Semiconductors (Springer)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG11 5C813 LJ72		
Course title (and course title in English)	電子材料学特論 Electronic Materials, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KIMOTO TSUNENOBU

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Fundamentals and recent progress in semiconductor materials and various advanced devices are explained.

[Course objectives]

[Course schedule and contents]

Si semiconductor,3-4times,Bulk growth, wafering, defect engineering, and impurity gettering of Si are reviewed. Silicon-On-Insulator (SOI) is also explained.
Advanced CMOS devices and materials,2-3times,Basic structures and performance enhancement of advanced CMOS devices, the core devices in LSI, are explained.
High-frequency devices and materials,2-3times,Structure and operation principle of high-frequency devices are explained. Semiconductor materials suitable for high-frequency applications are discussed.
Power devices and materials,2-3times,Structure and operation principle of power devices are explained. Semiconductor materials suitable for power conversion applications are discussed.

[Course requirements]

Basics of solid state physics and semiconductor engineering

[Evaluation methods and policy]

Report evaluation, taking account of lecture attendance

[Textbooks]

No textbook is assinged.

[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.

Course number	G-ENG11 5C816 LB72		
Course title (and course title in English)	分子エレクトロニクス Molecular Electronics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YAMADA HIROFUMI Graduate School of Engineering Associate Professor,KOBAYASHI KEI Part-time Lecturer,NODA KEI Part-time Lecturer,Part-time Lecturer

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

近年、有機ELディスプレイや有機トランジスタなど、有機分子を能動的な電子材料とする応用が進みつつある。本講義では、一般的に電気伝導性が著しく低いと考えられている有機分子のキャリア輸送性について、その微視的機構の基礎を理解するとともに、有機分子の有するさまざまな光・電気特性を学習する。また、単一／少数分子系で構成される分子素子への展開についても後述する。

[Course objectives]

有機分子-電極界面におけるキャリア注入機構および有機分子材料内部におけるキャリア輸送機構の基礎を理解するとともに、個々の分子がもつ多様な物性と有機材料の巨視的な光・電子的性質の関係を学習することを目的とする。

[Course schedule and contents]

分子エレクトロニクス研究の背景（3回）
分子エレクトロニクスは、単一分子あるいは少数分子系が示すユニークな電気特性を直接応用しようとする分子スケールエレクトロニクスと、主に有機薄膜系を対象とする有機薄膜エレクトロニクスの２つの分野から構成される。両者は異なる視点からの研究分野であるが、同時に強く相互に関連している。電子材料としての有機分子材料研究および分子エレクトロニクス研究の背景、およびその発展について講述する。

分子／有機薄膜エレクトロニクスの基礎（4回）
分子エレクトロニクス研究において用いられるさまざまな有機分子材料、有機導体、導電性高分子などの基本構造・基礎物性を理解するとともに、その電子状態・電子物性の基礎について講述する。

有機薄膜の作製と電気特性（3回）
有機薄膜の作製方法や結晶化挙動について解説する。さらに、導電性分子、半導体性分子、誘電性分子の電気特性を事例紹介し、その電子状態の概要について講述する。

有機半導体におけるキャリア伝導（3回）
電界発光（EL）ディスプレイや有機太陽電池などのデバイス開発において使用される有機半導体材料において、そのキャリア伝導機構について講述する。また、有機分子エレクトロニクスの近年の研究動向についても述べる。

分子エレクトロニクス研究の展開（1回）
今後の分子エレクトロニクスの展望について説明する。

Continue to 分子エレクトロニクス (2)↓↓↓

分子エレクトロニクス (2)

学習到達度の確認（1回）
学習到達度を確認する。

[Course requirements]

電子物性，固体物理に関する基礎知識があればよい。

[Evaluation methods and policy]

４回程度のレポートにより評価する。

[Textbooks]

ノート講義スタイルとする．また適宜資料を配布する．

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

配布資料ならびにノートを整理し、各自で講義内容を復習すること。

（Other information (office hours, etc.)）

当該年度の授業回数に応じて一部を省略することがある。 また授業順序についても適宜変更することがある。
隔年開講科目。

*Please visit KULASIS to find out about office hours.

Course number	G-ENG11 5C819 LB72				
Course title (and course title in English)	表面電子物性工学 Surface Electronic Properties		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YAMADA HIROFUMI Graduate School of Engineering Associate Professor,KOBAYASHI KEI	
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[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.

[Course objectives]

[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.

[Course schedule and contents]

[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.

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.

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.

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.

Mesoscopic phenomena and low-dimensional materials (3)
The lecture covers the following topics: Electronic properties of low-dimensional materials, Single electron tunneling, Quantized conductance, Tow-dimensional materials, Carbon nanotubes, Graphene.

Final check for the understanding of the course (1)

Continue to 表面電子物性工学(2)↓↓↓

表面電子物性工学(2)

[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.

未更新

Course number	G-ENG11 6C821 PB72		
Course title (and course title in English)	研究インターンシップM（電子） Research Internship(M)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG11 5C822 LJ72		
Course title (and course title in English)	光物性工学 Optical Properties and Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWAKAMI YOUICHI Graduate School of Engineering Associate Professor,FUNATO MITSURU

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2-3回times,
,7-8回times,
,4-5回times,
,1回times,

[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.

未更新

Course number	G-ENG11 5C825 LJ72		
Course title (and course title in English)	量子論電子工学 Quantum Theory for Electronics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KAKEYA ITSUHIRO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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 Hunt '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)

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.

未更新

Course number	G-ENG11 5C828 LJ72

Course title (and course title in English)	光量子デバイス工学 Quantum Optoelectronics Devices	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NODA SUSUMU Graduate School of Engineering Associate Professor,ASANO TAKASHI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

This course first explains electron system control and optic interactions via different kinds of quantum structure. To do so, the density matrix is derived, and the optical-absorption coefficient is determined using transmission matrix elements within quantum wells, quantum dots, and density of state. Next, it is shown that control is not only possible for electron systems but also for photon systems. Finally, several examples of photonic devices are introduced and explained.

[Course objectives]

Students will become adept at methods of calculating the light absorption coefficient and the refractive index within quantum structures. Students will also gain an understanding of the interaction of light (photons) and electrons.

[Course schedule and contents]

1. Introduction (1 class)
The academic background of photonic device engineering is described.

2. Analysis methods for electron/photon interactions (7 classes)
After a review of the basics of quantum mechanics, discussion is made of two-level system and light interaction. The necessity of density matrix theory is introduced, and it is shown that this can be used to describe both a pure state and a mixed state.
Explanation is made of the differences between energy relaxation and pure phase relaxation by deriving those differences from a physics (physical) model. Further, the steady state response of the density matrix vis-#224-vis light is derived, and explanation is made of methods of using this to calculate changes in the complex dielectric constant, the absorption coefficient, and the refractive index.

3. Electron system control and electron/photon interactions (4 classes)
Explanation is made of the interactions of electrons and light within various kinds of quantum structures. Taken up first are quantum wells, with discussion of a calculation method, using integration with consideration of band structure and state density, of the complex dielectric constant. After showing the absorption spectra and polarization characteristics of intersubband transitions, explanation is made of absorption spectra and polarization characteristics in interband transitions.

4. Photon control and electron/photon interactions (2 classes)
Discussion is made of spontaneous emission control based on photon state control. Taken up as examples of photon system control methods are optical microresonators and photonic crystals, and advanced control of light/electron interactions are introduced.

Continue to 光量子デバイス工学(2)↓↓↓

光量子デバイス工学(2)

5. Confirmation of extent of student learning (1 class)
Confirmation is made of the extent of student learning.

[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.

Course number	G-ENG11 5C830 LB72				
Course title (and course title in English)	量子計測工学 Quantum measurement		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SUGIYAMA KAZUHIKO	
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.4	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

The goal of this lecture is to understand that precision measurements are realized with combination of the best technologies and is based on physics.

[Course schedule and contents]

Introduction and principle of time measurement (1 time):
Two principles of time measurement: Reproducibility postulate and dynamic model

Fundamentals of atomic frequency standards (2.5 times):
Atomic states, its energy shifts, high-resolution spectroscopy and high-sensitive detection

Cesium frequency standard and atom interferometer (2.5 times):
Principle of Ramsey resonance and its interpretation as atom interferometer

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

Noise (2 times):
Incoherent signals and shot noise

Relativistic theory and time (3 times):
Impact of special and general relativistic theory on time measurement

Others (1 time)
If we have time, the frequency noises of masers and lasers, and other subjects will be lectured.

Evaluation of understanding (1 time)

[Course requirements]

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

Continue to 量子計測工学(2)↓↓↓

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 fuclty. I will use this on the topic "Noise".）

（Related URLs）

https://panda.ecs.kyoto-u.ac.jp/portal/site/2021-210-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 instructor: A1-124

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG11 5C846 PJ72		
Course title (and course title in English)	電子工学特別研修１(インターン) Advanced Seminar in Electronic Science and Engineering I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3,4,Fri.3,4	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,6times,

[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.

未更新

Course number	G-ENG11 5C848 PJ72		
Course title (and course title in English)	電子工学特別研修２(インターン) Advanced Seminar in Electronic Science and Engineering II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3,4,Fri.3,4	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,6times,

[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.

未更新

Course number	G-ENG11 5C851 LJ72		
Course title (and course title in English)	電気伝導 Electrical Conduction in Condensed Matter	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KAKEYA ITSUHIRO Graduate School of Energy Science Professor,DOI TOSHIYA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

This class in 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.

[Course schedule and contents]

Lattices and reciprocal lattices (2 classes)
Explanation is made of lattices and reciprocal lattices, a fundamental item for understanding electron properties within an atom.

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.

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.

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.

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.

Superconductivity (3 classes)

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.

未更新

Course number	G-ENG41 7R701 SB72		
Course title (and course title in English)	電子工学特別セミナー Advanced Seminar on Electronic Science and Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG41 7R823 PB72

Course title (and course title in English)	研究インターンシップD（電子） Research Internship (D)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG41 7R825 SB72		
Course title (and course title in English)	電子工学特別演習1 Advanced Exercises on Electronic Science and Engineering I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG41 7R827 SB72		
Course title (and course title in English)	電子工学特別演習2 Advanced Exercises on Electronic Science and Engineering II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKEUCHI SHIGEKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

Course number	G-ENG15 5D043 SJ60　G-ENG14 7D043 SJ61　G-ENG13 8D043 SJ61 G-ENG17 8D043 SJ76		
Course title (and course title in English)	先端科学機器分析及び実習 I Instrumental Analysis,Adv.I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Thu.4,5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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 I (2)↓↓↓

先端科学機器分析及び実習 I (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.

Course number	G-ENG17 8D046 SJ76 G-ENG15 5D046 SJ60 G-ENG14 7D046 SJ61 G-ENG13 8D046 SJ61		
Course title (and course title in English)	**先端科学機器分析及び実習II** Instrumental Analysis,Adv.II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	1	Year/semesters	2021/Second semester
Days and periods	Thu.4,5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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II(2)↓↓↓

先端科学機器分析及び実習 II (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.

Course number	G-ENG16 6D837 LJ61　G-ENG15 6D837 LJ61		
Course title (and course title in English)	Supramolecular Chemistry Supramolecular Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,Juha Lintuluoto Graduate School of Engineering Senior Lecturer,LANDENBERGER, Kira Beth

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Understanding the nature and types of supramolecular interactions, and applying them into various chemical, biological and other materials applications.

[Course schedule and contents]

1. Course Introduction & 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. 5

2. Binding Constants, Cooperativity, Complementarity, Preorganization Equilibrium systems, enthalpy and entropy upon binding, quantitative analysis Oct.12

3. Cation Binding with Current Examples Cation binding, binding into anionic host molecules and neutral host molecules Oct.19

4. Anion Binding with Current Examples Anion binding, binding into cationic host molecules, and neutral host molecules Oct. 26

5. Neutral molecule binding and Self-Assembly with Current Examples Neutral molecule binding into neutral or charged host molecules, self-binding molecules Nov.2

6. Supramolecular Devices, Sensors and Catalysis with Current Examples Electron transfer, energy transfer, information transfer in supramolecules Nov. 9

7. Crystal Engineering I: Crystal engineering, crystal classes, crystal nucleation and growth, commonly found intermolecular interactions Nov. 16

Continue to Supramolecular Chemistry (2)↓↓↓

Supramolecular Chemistry (2)

8. Crystal Engineering II: Polymorphism, hydrates and solvates, cocrystals, crystal structure prediction Nov. 30

9. Network Solids: Zeolites, intercalates, coordination polymers (e.g. MOFs) Dec.7

10. Solid State Inclusion Compounds I: Clathrates (structures and applications), podands, cyclophanes, etc. Dec. 14

11. Solid State Inclusion Compounds II: Cucurbiturils, cyclodextrins, cryptophands, etc. Dec. 21

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. 11

14. Supramolecular Polymers, Gels and Fibers: Supramolecular polymer structure and design, properties, kinetics and reaction mechanics of supramolecular polymers, applications Jan.18

[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.

Course number	G-ENG12 6H042 LJ60 G-ENG15 6H042 LJ60 G-ENG13 6H042 LJ60

Course title (and course title in English)	有機金属化学２ Organotransition Metal Chemistry 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NAKAO YOSHIAKI Graduate School of Engineering Professor,MURAKAMI MASAHIRO Graduate School of Engineering Professor,KONDOU TERUYUKI Graduate School of Engineering Professor,OOUCHI MAKOTO Graduate School of Engineering Associate Professor,MIKI KOUJI Graduate School of Engineering Associate Professor,KURAHASHI TAKUYA Graduate School of Engineering Associate Professor,FUJIHARA TETSUAKI Graduate School of Engineering Professor,OHKI YASUHIRO

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Fri.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

遷移金属錯体の合成法、構造的特徴、および重要な素反応と、それらの反応機構について解説する。また、隔年開講の「有機金属化学１」と連続的に講義を進め、遷移金属錯体を用いる触媒反応の有機合成化学、有機工業プロセスへの応用について解説する。

[Course objectives]

遷移金属錯体の化学についての基礎知識を習得する。また、それぞれの遷移金属錯体に特徴的な触媒反応の有機合成化学、有機工業プロセスへの応用について理解する。

[Course schedule and contents]

遷移金属錯体 I〜III(3回)
① 遷移金属錯体の構造（形式酸化数、１８電子則、配位子の種類、ハプト数など），② 遷移金属錯体の反応（配位子置換反応、酸化的付加、還元的脱離、トランスメタル化など）
③ 遷移金属錯体の反応（挿入、脱離、配位子に対する求核剤の反応、酸化的環化など）

不飽和結合の反応 I〜III(3回)
① ヒドロシアノ化、ヒドロアミノ化、ヒドロメタル化、カルボメタル化反応など。
② アルキン多量化、Pauson-Khand 反応、骨格異性化など
③ アルキンやアルケンの求電子的活性化を経る反応、カルベン錯体の反応、メタセシス

カップリング反応 I,II(2回)
① C-C 結合形成（酸化的カップリング、還元的カップリング、クロスカップリング、辻ートロスト型反応）、C-ヘテロ元素結合形成（C-O, C-N, C-B, C-Si 形成,
② C-C 結合形成（ヘック反応、藤原-守谷反応、C-H アリール化）

不活性結合活性化(1回)
C-H活性化（村井反応、ホウ素化、ヒドロアシル化、カルベン・ナイトレン挿入など）、C-C 活性化

Continue to 有機金属化学２ (2)↓↓↓

有機金属化学２ (2)

重合(1回)
配位重合、メタセシス重合、リビングラジカル重合、クロスカップリング重合

工業的反応(1回)
Reppe 反応、ヒドロホルミル化、Fischer-Tropsch 法、Monsant 法、アルコールの空気酸化、ワッカー酸化など

[Course requirements]

None

[Evaluation methods and policy]

学期末に行う筆記試験にて評価する。

[Textbooks]

Not used

[References, etc.]

（Reference books）
山本明夫 『有機金属化学－基礎と応用』（裳華房 (1982)）
From Bonding to Catalysis, John F 『Organotransition Metal Chemistry』（Hartwig, University Science Books (2010)）
山本明夫 『有機金属化学ー基礎から触媒反応まで』（東京化学同人 (2015)）
小澤文幸，西山久雄 『有機遷移金属化学』（朝倉書店 (2016)）

[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.

Course number	G-ENG13 6H818 LJ60 G-ENG15 6H818 LJ60 G-ENG16 5H818 LJ60

Course title (and course title in English)	先端有機化学 Advanced Organic Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI Graduate School of Engineering Associate Professor,MIURA TOMOYA Graduate School of Engineering Associate Professor,NAGAKI AIICHIROU Institute for Chemical Research Associate Professor,TAKAYA HIKARU Graduate School of Engineering Associate Professor,KIMURA YUU

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Chemoselectivity (2 sessions)
Introduction and chemoselectivity

Regioselectivity (2 sessions)
Controlled Aldol Reactions

Stereoselectivity (2 sessions)
Stereoselective Aldol Rections

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

Continue to 先端有機化学(2)↓↓↓

先端有機化学(2)

[Course requirements]

Students should have a good understanding of undergraduate organic chemistry.

[Evaluation methods and policy]

Comprehensive evaluation by quizzes of each unit and investigation / presentation of the total synthetic route of target compound.
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.

未更新

Course number	G-ENG12 6D037 EJ61				
Course title (and course title in English)	材料化学特別実験及演習 Laboratory and Exercise in Material Chemistry	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,TANAKA KATSUHISA		
Target year		Number of credits	8	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,60times,

[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.

未更新

Course number	G-ENG12 5H001 LJ62

Course title (and course title in English)	無機材料化学 Chemistry of Inorganic Materials	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences 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

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Structure, characterization, synthesis, and properties of inorganic materials are described on the basis of solid-state chemistry of inorganic matters.

[Course objectives]

[Course schedule and contents]

,1time,
,4times,
,4times,
,1time,
,1time,

[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.

未更新

Course number	G-ENG12 5H004 LJ60		
Course title (and course title in English)	有機材料化学 Chemistry of Organic Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NAKAO YOSHIAKI Graduate School of Engineering Professor,MATSUBARA SEIJIROU Graduate School of Engineering Associate Professor,KURAHASHI TAKUYA

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,1time,
,3times,
,1time,
,1time,
,3times,
,2times,
,2times,

[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.

未更新

Course number	G-ENG12 5H007 LJ62		
Course title (and course title in English)	高分子材料化学 Chemistry of Polymer Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NUMATA KEIJI Graduate School of Engineering Associate Professor,HORINAKA JIYUNICHI Graduate School of Engineering Senior Lecturer,OOMAE MASASHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

physical properties of polymers,3times,physical properties of polymers
structure and physics of high-performance polymers,3times,structure and physics of high-performance polymers
molecular design and function of functional polymers,6times,molecular design and function of functional polymers
,,

[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.

Course number	G-ENG12 6H010 LJ61		
Course title (and course title in English)	機能材料化学 Chemistry of Functional Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUJITA KOJI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Week 1-2 High-pressure synthesis of inorganic materials
Week 3 Development of functional materials using laser material processing
Week 4 Magneto-optical materials
Week 5 Synthetic organic chemistry driven by artificial intelligence (AI)
Week 6 Catalytic reactions in organic chemistry
Week 7 High-performance separation analysis using specific interactions
Week 8-9 Biomaterial design for disease treatment
Week10 Mechanical properties of polymers
Week11 Development of novel functional electrodes for electroanalysis

[Course requirements]

None

[Evaluation methods and policy]

Grading will be based on active participation and assignments. Assignments 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)]

Students are requested to review the lectures

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG12 6H013 LJ62

Course title (and course title in English)	無機構造化学 Chemistry and Structure of Inorganic Compounds	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MIURA KIYOTAKA Graduate School of Engineering Associate Professor,SHIMOTSUMA YASUHIKO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester

Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

無機材料の非晶質状態と結晶の構造、構造に基づく物理的・化学的特性とその制御法、工業材料としての応用などについて述べる.

[Course objectives]

無機固体や無機材料の構造に関する知識を得て、専門的な論文を読んで内容を理解できるようになる。

[Course schedule and contents]

計算材料化学（2回）
無機固体を対象とした理論化学と計算機化学について講述する．無機結晶を対象とした電子構造の解釈，非晶質固体を対象とした分子動力学シミュレーションの原理とシミュレーションによって得られる結果と実験との対比などを説明する.

分光法を用いた無機固体の構造解析（3回）
さまざまな分光法の原理を説明し，無機固体への適用例を説明する．具体的には，光吸収と蛍光スペクトル，赤外およびラマン分光，核磁気共鳴，電子スピン共鳴，メスバウアー分光などを解説し，これらの分光法が無機固体の構造解析においてどのような情報を提供するかを述べる.

回折法を用いた無機固体の構造解析（2回）
X線回折を中心に，解説法の原理と結晶の構造解析の基礎を講述する．X 線を用いた他の構造解析，すなわち，XPS，EXAFSなどについても触れる．また，電子顕微鏡の原理についても解説する．これらの構造解析の手法を具体的な無機固体に適用した例も述べる.

ナノ構造材料（2回）
光ファイバーやフォトニック結晶など，特にフォトニクスの分野で注目されている無機材料を取り上げ，ナノ構造が機能を発現する原理とナノ構造の作製方法について講述する.

マイクロ構造材料（2回）
高温セラミックスや電子セラミックスなどの実用セラミックスのマイクロ構造と発現する機能について講述する.

Continue to 無機構造化学 (2)↓↓↓

無機構造化学 (2)

[Course requirements]

京都大学工学部工業化学科「無機化学（創成化学）」程度の無機固体化学に関する入門的講義の履修を前提としている．

[Evaluation methods and policy]

レポートの結果に基づいて判定する．

[Textbooks]

授業で配布するプリントを使用する．

[References, etc.]

（Reference books）

特になし

[Study outside of class (preparation and review)]

講義の内容に関して予め自ら専門書などで理解を深めるとともに、講義の終了後は学習した内容を配布されたプリントなどで確認すること。

（Other information (office hours, etc.)）

隔年開講科目．化学系6専攻の旧課程ならびに化学系6専攻以外の専攻の受講生には，追加レポートを課す．

*Please visit KULASIS to find out about office hours.

Course number	G-ENG12 6H022 LJ60		
Course title (and course title in English)	有機天然物化学 Chemistry of Organic Natural Products	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NAKAO YOSHIAKI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Thu.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

天然由来の高次構造を有する有機分子を対象にして，その生合成経路、生物活性などについて講述する

[Course objectives]

講義概要で述べたことがらを習得し，天然由来の有機化合物の生合成経路とそれらの生理活性が理解できるようになる.

[Course schedule and contents]

生合成における有機化学反応（1回）
 生体中で酵素によって触媒される有機化学反応について，生合成を理解するうえで重要なものに絞って解説する.

酢酸ーマロン酸経路（3回）
酢酸ーマロン酸経路によって生じる有機化合物の生合成経路と生理活性などについて解説する.

シキミ酸経路（2回）
シキミ酸経路によって生じる有機化合物の生合成経路と生理活性などについて解説する.

メバロン酸ーMEP経路（3回）
メバロン酸ーMEP経路によって生じる有機化合物の生合成経路と生理活性などについて解説する.

アミノ酸経路（2回）
アミノ酸経路によって生じる有機化合物の生合成経路と生理活性などについて解説する.

[Course requirements]

京都大学工学部工業化学科「有機化学I~III(創成化学)」を履修していることを前提とする.

[Evaluation methods and policy]

毎講義小テストを行うとともに，期末試験の結果に基づいて判定する.

Continue to 有機天然物化学 (2)↓↓↓

有機天然物化学 (2)

[Textbooks]

随時プリントを配付する．

[References, etc.]

（Reference books）

Paul M. Dewick 『Medicinal Natural Products: A Biosynthetic Approach,, 』（Wiley, 2009）

[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.

Course number	G-ENG12 5H031 LJ62		
Course title (and course title in English)	生体材料化学 Chemistry of Biomaterials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NUMATA KEIJI Graduate School of Engineering Senior Lecturer,OOMAE MASASHI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

生物機能を意識した材料には，1）多成分が有機的に関係して現れる高度な機能、および，2） 35億年をかけた進化の結果，地球環境に優しいシステムとして機能発現している，の二つの重要な観点が必要である．生物機能を分子レベルで学びながら，その特徴を指向した，あるいは，模倣した材料創成の現状と将来について解説する．

[Course objectives]

生体機能・生物機能は多岐にわたり、その背景にある戦術には、持続的社会を形成する際に極めて重要なポイントが多々ある。このような生物学の視点に基づいた材料開発の指針を理解するため、関連する高分子科学、生化学、およびケミカルバイオロジーを習得することを目標とする。

[Course schedule and contents]

生物の構造・機能を利用した材料化学（6回）
生体を構成する高分子について、その構造と機能について材料レベルおよび分子レベルで紹介する．特に、ペプチドやタンパク質に関連する人工的なシステムや材料の現状を取り上げ、天然材料の分子機構と比較しながら評価を行う．さらに、生体機能を指向した未来材料について概説する．具体的には、生体高分子の概要（1回）、ペプチドやタンパク質の合成（1回）、物性（1回）、構造（1回）、機能（1回）、および材料化の事例（1回）について説明する。

生体と多糖とのコミュニケーション（6回）
糖類の構造と分類など、機能を理解するための基礎知識について説 明する。(1回)
複合糖質の基礎として、生物界において糖質が機能発現する複合糖質について説明する。（2回）
糖質と疾患として、糖質が様々な疾患に関連する生体分子であることを説明する。(2回)
糖質の材料利用について、糖質の機能を利用した材料応用研究と産業利用されている糖質について説明する。(1回)

[Course requirements]

None

[Evaluation methods and policy]

高分子科学および生化学を中心とした生体関連物質化学に関する講義内容の理解度の判定を目的に、成績評価は、出席状況に加えて、試験もしくはレポートにより行うことを基本とする。

[Textbooks]

配布するレジュメを使用する．

Continue to 生体材料化学 (2)↓↓↓

生体材料化学 (2)

[References, etc.]

（Reference books）
高分子学会編 『基礎高分子科学』（東京化学同人, 2020）
『ヴォート基礎生化学』（東京化学同人）
『The Cell 細胞の分子生物学』（ニュートンプレス）

[Study outside of class (preparation and review)]

未入力

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG12 6H034 LJ61		
Course title (and course title in English)	材料解析化学II Analysis and Characterization of Materials II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OTSUKA KOJI Graduate School of Engineering Associate Professor,OYAMA MUNETAKA Graduate School of Engineering Associate Professor,KUBO TAKUYA

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

The frontier of analytical chemistry of materials that makes full use of cutting-edge technology is introduced.

[Course objectives]

Understand the principle, outline and application of the latest advanced instrumental analysis methods in the field of analytical chemistry of materials.

[Course schedule and contents]

High-speed microseparation analysis method (4)
The principle and applications of microchip analytical separation method (microchip electrophoresis / liquid chromatograph) that realizes high-performance separation in an extremely short time by further speeding up and miniaturizing capillary electrophoresis are lectured.

Analytical chemistry using metal nanoparticles (3)
Metal nanoparticles have also been used as new functional materials in recent years in the field of analytical chemistry. After explaining the characteristics and chemical preparation methods of such metal nanoparticles, their application to analytical chemistry, especially electron transfer in modified electrodes and their use as electrode catalyst elements, will be introduced.

Design of separation media for actual sample analysis (3)
In the design of separation media for solid-phase extraction required when handling biological samples and environmental samples, the method of imparting separation selectivity and the performance evaluation method of the obtained separation media.

State-of-the-art material analysis technology / confirmation of learning achievement (1)
Introducing the latest technological innovations in analytical chemistry of materials in a topical manner. At the same time, check the learning achievement level.

Feedback on evaluation of regular tests, etc. (1)
Give feedback on evaluations such as regular tests.

Continue to 材料解析化学II (2)↓↓↓

材料解析化学II (2)

[Course requirements]

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 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.

Course number	G-ENG12 6P057 LB62		
Course title (and course title in English)	材料化学特論第三 Material Chemistry Adv. III	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,TANAKA KATSUHISA

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

材料化学の各専門分野におけるトピックスについて、集中講義の形式で学修する。なお、材料化学専攻以外の専攻所属の学生は、履修に際して材料化学専攻長に説明を受けること。

[Course objectives]

先端材料の合成と構造－物性相関を中心に、基礎から応用まで材料化学分野の現状および将来の展望についての知識を得る。

[Course schedule and contents]

トピックス講述（4回）
材料化学の各専門分野におけるトピックスについての集中講義。

[Course requirements]

None

[Evaluation methods and policy]

授業時に課すレポート及び履修後に課すレポートにより評価する。

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）
特になし。

[Study outside of class (preparation and review)]

必要に応じ指示する

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG12 6P058 LB62		
Course title (and course title in English)	材料化学特論第四 Material Chemistry Adv. IV	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,TANAKA KATSUHISA

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

材料化学の各専門分野におけるトピックスについて、集中講義の形式で学修する。なお、材料化学専攻以外の専攻所属の学生は、履修に際して材料化学専攻長に説明を受けること。

[Course objectives]

先端材料の合成と構造－物性相関を中心に、基礎から応用まで材料化学分野の現状および将来の展望についての知識を得る。

[Course schedule and contents]

トピックス講述（4回）
材料化学の各専門分野におけるトピックスについての集中講義。

[Course requirements]

None

[Evaluation methods and policy]

授業時に課すレポート及び履修後に課すレポートにより評価する。

[Textbooks]

Instructed during class
特になし。

[References, etc.]

（Reference books）
特になし。

[Study outside of class (preparation and review)]

必要に応じ指示する

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG12 7P110 LB61		
Course title (and course title in English)	材料化学総論 General Material Chemistry	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,TANAKA KATSUHISA

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,

[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.

未更新

Course number	G-ENG12 7P111 LJ61				
Course title (and course title in English)	化学産業特論 Chemical Industry, Advanced		Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,TANAKA KATSUHISA	
Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,

[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.

Course number	G-ENG42 7S001 LJ61		
Course title (and course title in English)	機能材料設計学 Design of Functional Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUJITA KOJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Week 1-2 High-pressure synthesis of inorganic materials
Week 3 Development of functional materials using laser material processing
Week 4 Magneto-optical materials
Week 5 Synthetic organic chemistry driven by artificial intelligence (AI)
Week 6 Catalytic reactions in organic chemistry
Week 7 High-performance separation analysis using specific interactions
Week 8-9 Biomaterial design for disease treatment
Week10 Mechanical properties of polymers
Week11 Development of novel functional electrodes for electroanalysis

[Course requirements]

None

[Evaluation methods and policy]

Grading will be based on active participation and assignments. Assignments 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)]

Students are requested to review the lectures

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG42 7S002 SJ61		
Course title (and course title in English)	機能材料設計学特論 Design of Functional Materials, Advanced	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUJITA KOJI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

In this course, we will offer lectures about recent progress and future prospects for the development of functional materials in a seminar format.

[Course objectives]

To promote problem-solving abilities by understanding comprehensively the research results and latest trends in the development of functional materials.

[Course schedule and contents]

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

[Course requirements]

None

[Evaluation methods and policy]

Grading will be based on active participation and assignments. Assignments 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)]

Students are requested to review the lectures.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG42 7S003 SJ62

Course title (and course title in English)	無機構造化学特論 Inorganic Structural Chemistry, Advanced	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MIURA KIYOTAKA Graduate School of Engineering Associate Professor,SHIMOTSUMA YASUHIKO Graduate School of Engineering Assistant Professor,shimizu masahiro

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,8times,
,7times,

[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.

未更新

Course number	G-ENG42 7S006 SJ62		
Course title (and course title in English)	応用固体化学特論 Industrial Solid-State Chemistry, Advanced	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,TANAKA KATSUHISA

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

Students will learn recent topics and future prospects in the fields of solid-state chemistry and its applications by attending a seminar.

[Course objectives]

To be able to grab the trends of research in the fields of solid-state chemistry and its applications.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Evaluation will be based on class performance.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

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.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG42 7S010 SJ59		
Course title (and course title in English)	有機反応化学特論 Organic Reaction Chemistry, Advanced	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUBARA SEIJIROU

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,１５times,

[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.

未更新

Course number	G-ENG42 7S013 SJ60		
Course title (and course title in English)	天然物有機化学特論 Organic Chemistry of Natural Products, Advanced	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NAKAO YOSHIAKI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

Course number	G-ENG42 7S016 SJ61		
Course title (and course title in English)	材料解析化学特論 Analytical Chemistry of Materials, Advanced	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OTSUKA KOJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.4	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

Study the recent progress and future prospects of analytical chemistry of materials in a seminar format.

[Course objectives]

Understanding recent progress, current status and future prospects of material analysis chemistry.

[Course schedule and contents]

Seminar / Intensive lecture (15): Lecture on the latest topics in analytical chemistry of materials.

[Course requirements]

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".

[Evaluation methods and policy]

Comprehensively evaluate the content of presentations and discussions at seminars.

[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.

未更新

Course number	G-ENG42 7S019 SJ61

Course title (and course title in English)	高分子材料物性特論 Physical Properties of Polymer Materials, Advanced	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,HORINAKA JIYUNICHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG42 7S022 SJ62		
Course title (and course title in English)	高分子材料合成特論 Synthesis of Polymer Materials, Advanced	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NUMATA KEIJI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

Course number	G-ENG13 7D228 LJ60		
Course title (and course title in English)	物質エネルギー化学特論第一 Energy and Hydrocarbon Chemistry, Adv. I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,MUROYAMA HIROKI Graduate School of Engineering Assistant Professor,SUZUKI HAJIME Graduate School of Engineering Assistant Professor,MIURA RISAKO

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

現在、我々の生活は様々な物質の特性や機能に支えられている。今後も、新たに多様な化合物や材料が開発され、持続可能な社会の構築を目指していくことになる。新規な化合物や材料を設計する上で、既存の物質の特性やその発現要因を理解することは重要である。本講義では、エネルギー変換材料や、触媒材料、バイオ材料に関する最新の研究内容を通して、化合物や材料の設計方針や機能発現について概説する。

[Course objectives]

エネルギー変換材料や、触媒材料、バイオ材料の設計手法およびこれらの材料が有する機能について知見を得る。また、これらの材料を利用して構築したシステムの理解を深める。

[Course schedule and contents]

資源・エネルギーの動向（2回）
国内・海外の資源・エネルギーの動向、水素エネルギー社会へ向けた取り組みについて概説する。

水素キャリアの製造・利用技術（2回）
アンモニアや有機ハイドライドなどの水素キャリアの製造・利用技術について概説する。

電気化学デバイスとその材料開発（3回）
燃料電池や電解セルなどの電気化学デバイスの開発やそれらに使用される材料に関する研究について概説する。

半導体光触媒・光電極概論（2回）
クリーンな水素製造法として期待されている半導体光触媒や光電極を用いた水分解について概説する。

可視光水分解用光触媒の開発動向（2回）
可視光で駆動する水分解用光触媒について、最新のトピックスや物性評価手法を概説する。

バイオマテリアル概論 (1回)
バイオマテリアルの設計について、最近のトピックスを中心に概説する。

高分子会合体と薬物送達 (2回)
合成高分子や多糖、核酸等による会合体形成や薬物送達技術について概説する。

フィードバック（1回）
課題に関するフィードバックを行う。

Continue to 物質エネルギー化学特論第一 (2)↓↓↓

物質エネルギー化学特論第一 (2)

[Course requirements]

学部レベルの有機・無機・分析・物理化学の基礎知識を有することが望ましい。

[Evaluation methods and policy]

講義の際に小問題を出す。また、各担当教員の最終講義時にレポート課題を課し、これらにより評価する。

[Textbooks]

Not used

[References, etc.]

（Reference books）

工藤徹一他 著 『燃料電池』（内田老鶴圃）
小島由継 監修 『アンモニアを用いた水素エネルギーシステム』（シーエムシー出版）
橋本和仁、藤嶋昭 監修　『図解 光触媒のすべて』（ローム社）
橋田充、高倉喜信 著 『図解で学ぶDDS』（じほう）

[Study outside of class (preparation and review)]

必要に応じて連絡する。

（Other information (office hours, etc.)）

授業計画と内容はあくまで予定であり、場合によっては順序・内容等の変更がある。
授業計画と内容は、物質エネルギー化学特論第二と併せたものを記載している。
隔年開講科目。

*Please visit KULASIS to find out about office hours.

Course number	G-ENG13 7D229 LJ60		
Course title (and course title in English)	物質エネルギー化学特論第二 Energy and Hydrocarbon Chemistry, Adv. II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,MUROYAMA HIROKI Graduate School of Engineering Assistant Professor,SUZUKI HAJIME Graduate School of Engineering Assistant Professor,MIURA RISAKO

Target year		Number of credits	1	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

物質エネルギー化学特論第一に準ずる。

[Course objectives]

物質エネルギー化学特論第一に準ずる。

[Course schedule and contents]

物質エネルギー化学特論第一に準ずる。

[Course requirements]

物質エネルギー化学特論第一に準ずる。

[Evaluation methods and policy]

講義の際に小問題を出す。また、各担当教員の最終講義時にレポート課題を課し、これにより評価する。

[Textbooks]

Not used

[References, etc.]

（Reference books）
物質エネルギー化学特論第一に準ずる。

[Study outside of class (preparation and review)]

必要に応じて連絡する。

（Other information (office hours, etc.)）

授業計画と内容はあくまで予定であり、場合によっては変更がある。
隔年開講科目。

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG13 6D234 EJ60				
Course title (and course title in English)	物質エネルギー化学特別実験及演習 Experiments & Exercises in Energy and Hydrocarbon Chemistry, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI		
Target year		Number of credits	8	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,
,10times,
,10times,
,10times,

[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.

未更新

Course number	G-ENG13 7D235 LJ60		
Course title (and course title in English)	物質エネルギー化学特論第七 Energy and Hydrocarbon Chemistry, Adv.VII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI Graduate School of Engineering Associate Professor,KIMURA YUU

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,2times,
,1time,
,,
,,
,,
,,

[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.

未更新

Course number	G-ENG13 7D236 LJ60		
Course title (and course title in English)	物質エネルギー化学特論第八 Energy and Hydrocarbon Chemistry, Adv.VIII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI Graduate School of Engineering Associate Professor,MIKI KOUJI

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,2times,

[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.

Course number	G-ENG13 6H200 LJ61		
Course title (and course title in English)	**電気化学特論** Electrochemistry, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ABE TAKESHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Thu.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

非水溶液中での電気化学を理解することを目的とする。そのために、まず非水溶液を分類し、その化学的性質、物理的性質を示す。その後、電気化学反応の速度論について学ぶ。

[Course objectives]

・非水溶液の分類とその酸塩基の理解
・非水溶液中での電気化学反応の速度論の理解
・電気化学測定法の理解

[Course schedule and contents]

電気化学システムに関するIntroduction（1回）
・電気化学システムの特徴とその材料に要求される物性
・電気化学操作と工業との関わり
・電気化学と関連分野

非水溶液の特性（4回）
・非水溶液の酸塩基
・溶媒和
・伝導度
・純度

物質移動過程（2回）
・電極反応物質，生成物の電極表面と溶液バルクの間の移動
・拡散と泳動
・物質移動律速過程

測定法（3回）
・一般的な測定法

応用（1回）
・電池など

Continue to 電気化学特論 (2)↓↓↓

電気化学特論 (2)

[Course requirements]

４回生配当の学部科目である電気化学をすでに修得していることを前提として講義を進める.

[Evaluation methods and policy]

筆記試験の結果に基づいて判定する

[Textbooks]

Not used
講義内容に沿った資料を配布する.

[References, etc.]

（Reference books）

Kosuke Izutsu 『Electrochemistry in Nonaqueous Solutions』

[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.

Course number	G-ENG13 6H202 LJ60		
Course title (and course title in English)	物質環境化学 Green and Sustainable Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI Graduate School of Engineering Professor,SAKKA TETSUO Graduate School of Engineering Professor,ABE RYUU

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Chemistry of light energy conversion by semiconductors]
The global environmental impact of energy use has become a serious issue, as has the spread of renewable energy. The conversion of solar energy into electricity utilizes properties of semiconductors. In this lecture, we will explain electrical properties, optical properties, junction and interface structures, and applications to solar cells of semiconductors in four parts, with the conversion of light energy into electrical energy in mind.

[Green Chemistry]
Green Chemistry is a chemistry and science and technology system that comprehensively achieves goals in terms of both economy and environment based on the basic principles of science, and it greatly contributes to the realization and development of an environment-friendly and sustainable society. In this charge, from among those related to the creation, design, and application of chemical substance manufacturing processes that can reduce the production and use of harmful substances, 'atom efficient manufacturing processes, ' environmentally friendly catalysts,' and 'in chemical synthesis.' Recent developments such as ' environmentally friendly reaction medium' will be explained in four parts.

[Recent progress in catalytic organic reactions that contribute to environmental conservation]
In this lecture, we will explain the recent progress of catalytic conversion reactions that contribute to environmental conservation, and explain results selected from treatises recently reported in major international academic journals, including their ideas, originality, novelty, and superiority. Then, we will recognize problems that conventional chemical conversion methods create for the environment, and give four lectures on the cutting-edge efforts being made to change them.

[Course objectives]

[Chemistry of light energy conversion by semiconductors]
・ The use of solar energy
・ Band structure, electrical properties, and optical properties of semiconductors as the basis of semiconductors
・ Semiconductor bonding and semiconductor interfaces
・ Silicon solar cells, wet solar cells, and new solar cells as light energy conversion devices

[Green Chemistry]
・ Green Chemistry.
・ Concept of atom efficiency, atom efficient conversion process
・ Eco-friendly catalysts
・ Environmentally friendly reaction media

Continue to 物質環境化学 (2)↓↓↓

物質環境化学 (2)

[Recent progress in catalytic organic reactions that contribute to environmental conservation]
・ Catalytic conversion reaction of carbon dioxide
・ Highly efficient catalytic conversion reaction of unactivated substrates
・ Methodology of molecular catalyst development that contributes to environmental conservation

[Course schedule and contents]

Semiconductor basics (once)
・ Semiconductor band structure
・ Electrical properties of semiconductors
・ Optical properties of semiconductors

Semiconductor junction and semiconductor interface (1 session)
・ P-n junction
・ Semiconductor solution interface
・ Semiconductor electrochemical

Light energy conversion device (1 time)
・ Silicon solar cell
・ Wet solar cells
・ New solar cell

Introduction to Green Chemistry (1 time)
・ Guidance on general lectures
・ What is green chemistry?
・ E-factor and atom efficiency (atom economy)
・ Organic synthesis from the viewpoint of Green Chemistry

Atomic efficient manufacturing process: Using homogeneous catalytic reaction as an example (1 session)
・ Lewis acid alternative metal complex catalyst
・ Base-substitute metal complex catalyst
・ Acid-base composite alternative catalyst
・ Oxidation catalyst

Environmentally friendly catalyst: Taking a photooxidation / reduction catalyst as an example (1 session)
・ Electron transfer oxidation catalyst
・ Electron transfer reduction catalyst

Environmentally friendly reaction medium (1 session)
・ Underwater reaction
・ Supercritical fluid
・ Fluorine-based organic solvent
・ Ionic liquid

Catalytic organic chemistry using carbon dioxide as a substrate (1) (1 session)
・ Lecture outline explanation
・ Physical characteristics of carbon dioxide

Continue to 物質環境化学 (3)↓↓↓

物質環境化学 (3)

・ Electronic state of carbon dioxide

Catalytic organic chemistry using carbon dioxide as a substrate (2) (1 session)
・ Recent results of catalytic conversion reactions using carbon dioxide as a substrate
・ Reaction mechanism of catalytic conversion reaction using carbon dioxide as a substrate

High-efficiency catalytic conversion reaction of low-reactivity substrate (1) (1 session)
・ Highly efficient utilization of unactivated substrate
-Reaction mechanism of catalytic reaction using unactivated substrate

High-efficiency catalytic conversion reaction of low-reactivity substrate (2) (1 session)
・ Basics of CH activation reaction
-Recent results of catalytic conversion reaction through CH activation reaction

[Course requirements]

[Chemistry of light energy conversion by semiconductors]
No prior knowledge of a specific subject is required, but lecture will be conducted on the premise that basic knowledge at the undergraduate level has been acquired.

[Green Chemistry]
Lectures will be conducted on the premise that students have already acquired basic knowledge at the undergraduate level, such as organic chemistry.

[Recent progress in catalytic organic reactions that contribute to environmental conservation]
Lectures will be conducted on the premise that students have basic knowledge at the undergraduate level on subjects such as organic chemistry, physical chemistry, and inorganic chemistry.

[Evaluation methods and policy]

The grades of each shared lecture are evaluated by combining the normal score (30%) and the written test (70%), and based on the average score of the three students, 5 grades (A +: 96-100 points / A: 85-95 points / C: 65-74 points / D: 60-64 points / F: less than 60 points) will be the final evaluation of this lecture.

[Textbooks]

Distribute materials to be used based on the content of lectures.

[References, etc.]

（Reference books）
Others

（Related URLs）

(none)

Continue to 物質環境化学 (4)↓↓↓

物質環境化学 (4)

[Study outside of class (preparation and review)]

Students should briefly glance over the handouts and References, and prepare for the contents of each unit before attending any lecture. In addition, we will deepen our understanding of the contents of each unit by actively engaging in literature research and learning about topics introduced in each lecture. It would be advisable for students to devote twice the amount of time spent in teaching sessions to prepare for and review each.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG13 5H205 LJ60

Course title (and course title in English)	無機固体化学 Inorganic Solid-State Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI Graduate School of Engineering Associate Professor,Cedric Tassel

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Thu.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

金属酸化物を中心とする無機結晶固体について、構成元素の相互作用や結合様式、結晶構造について講述し、これらの違いが磁性，電気伝導性，光物性など の機能性とどのように結びついているかを、基礎から最新のトピックスを含め て解説する。また、最新の合成、測定法についても紹介する。最後に、材料の結晶構造を実際に決定する方法を教えます。

[Course objectives]

　化学系の学生は誰しも原子、分子を出発として物事を理解しようとする。そう考えるとアボガドロ数もの巨大分子といえる無機材料は攻略できそうにないものにみえてくる。一方で、物理系の学生は分子や結合などわからなくても数式をつかって強磁性、超電導などの物性を見事に理解してきた。このように化学と無機固体には大きなギャップがあるように見えるが、本講義によって、化学的視点に立って無機結晶の結合、構造をみることの重要性を理解し、物理に対して恐怖心、アレルギーを取除くことを目指す。
　直接的であれ、間接的であれ、無機物を扱うのであればどの分野（電気化学、界面化学、触媒化学、、、、）であっても結晶構造を理解することは必須である。その意識をもって授業に望んでもらえば得るものは大きいと思うので、そのように全ての受講生に感じてもらえることが最終目標。
また、データを解析して結晶構造を決定するための戦略を学びます。回折データからどのような情報が得られるかを実践的に学びます。

[Course schedule and contents]

固体の化学結合について（2回）
・分子軌道法からみた固体の電子状態（０、１次元）
・分子軌道法からみた固体の電子状態（２次元）
・分子軌道法からみた固体の電子状態（３次元）

結晶学、対称性、物性（4回）
・結晶学の歴史（紀元前から現代まで）
・結晶点群
・ブラベ格子から空間群へ
・X線、中性子回折
・結晶構造と物性の関係（１）
・結晶構造と物性の関係（２）

結晶構造の分類（5回）
Practical determination of the crystal structure of solid state materials from diffraction data (5回)
・Determination of the lattice parameters and space group.
・How to fit a profile. What information can we extract?

Continue to 無機固体化学 (2)↓↓↓

無機固体化学 (2)

・Rietveld refinement 1. Determining the structure of a material from zero.
・Rietveld refinement 2. Analyzing the structure of materials

[Course requirements]

None

[Evaluation methods and policy]

レポート（７割）、平常点評価（３割）

[Textbooks]

授業で配布するプリントを使用。演習のためパソコンを使う。

[References, etc.]

（Reference books）
『固体の電子構造と化学』
『群論の化学への応用』
『Fundamentals of Powder Diffraction and Structural Characterization of Materials』

[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.

未更新

Course number	G-ENG13 6H208 LB60		
Course title (and course title in English)	物質エネルギー化学特別セミナーA Seminar on Energy & Hydrocarbon Chemistry (A)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	1.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,6times,
,5times,

[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.

Course number	G-ENG13 7H213 LJ60		
Course title (and course title in English)	有機触媒化学 Catalysis in Organic Reactions	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Students will learn the basics of homogeneous catalytic reactions as key reactions used in total synthesis research of natural products, and deepen their understanding of efficient construction methods of carbon skeletons. We will also discuss organic synthesis reactions and various reactants that are highly useful from the viewpoint of functional group selectivity and stereoselectivity. At the end of each lecture, a quiz (confirmation test) on what you learned in the unit will be conducted to cultivate the ability to apply homogeneous catalytic reactions and organic conversion methods.

[Course objectives]

- Construction of retrosynthetic routes for structurally complex compounds
- Chemistry of protecting groups
- Basic organometallic reactions
- Cross-coupling reaction
- Asymmetric synthesis
- How to use synthetic chemistry of alkene complexes
- How to use synthetic chemistry of metathesis reactions
- Asymmetric aldol reaction
- Organic catalysts
- Diels-Alder reaction
- Cyclization oligomerization reaction of alkynes
- How to use synthetic chemistry of carbene and nitrene complexes

[Course schedule and contents]

Total synthesis of Minfiensine (2 sessions)
- Guidance on general lectures
- Transmetallation reaction
- Suzuki / Miyaura coupling reaction
- Asymmetric Mizoroki-Heck reaction
- Synthetic chemical utilization of alkene complexes

Total synthesis of Vitamin E (1 session)
- Asymmetric Domino Wacker-Heck reaction

(+)-Total synthesis of Laurenyne (1 session)
- CBS asymmetric reduction reaction
- [3,3] Sigmatropic reaction

Continue to 有機触媒化学 (2)↓↓↓

有機触媒化学 (2)

(+)-Total synthesis of Cyanthiwigin U (2 sessions)
・ Alkene metathesis reaction
・ Chiral pool method

Total synthesis of Miriaporone 4 (2 sessions)
・ Evans aldol reaction
・ Alcohol oxidation reaction by TEMPO and IBX
・ 1, 3-Dipole addition reaction

Total synthesis of BIRT-377 (1 session)
・ Organic catalyst
・ Pinnick oxidation reaction
.
(-)-Total synthesis of Tetrodotoxin (2 sessions)
・ Reaction of carbene complex
・ Reaction of nitrene complex
・ Chiral pool method
・ Felkin-Anh model

[Course requirements]

Lectures on synthetic organic chemistry and organometallic chemistry will proceed on the premise that you have already acquired basic knowledge at the undergraduate level.

[Evaluation methods and policy]

A quiz is given at the end of each lecture, and results of the quiz and final exam for each lecture are evaluated comprehensively.

[Textbooks]

Distribute materials to be used with the content of the lecture.
http://www.eh.t.kyoto-u.ac.jp/ja

[References, etc.]

（Reference books）

Translated by Shinji Murai, "Organic Synthesis by Hegedas Transition Metals" (2011, Tokyo Kagaku Dojin), Translated by Takanori Shibata, et al., "Synthetic Organic Chemistry" by RK Parashar (2011, Tokyo Kagaku Dojin), W. Carruthers and I. Coldham "Modern" Methods of Organic Synthesis 4th Ed .; Cambridge University Press: Cambridge, 2004. (Cambridge, 2004.), J. F. Hartwig "Organotransition Metal Chemistry" (University Science Books) ISBN: 978-1-891389-53-5

[Study outside of class (preparation and review)]

Students should briefly glance over handouts and References to prepare for the contents of each unit before attending any lecture. In addition, students will actively work on assignments given in each teaching session to deepen their understanding of these contents. It is advisable for students to devote twice the amount of time spent in teaching sessions to preparing for and reviewing the teaching sessions.

Continue to 有機触媒化学 (3)↓↓↓

有機触媒化学 (3)

（Other information (office hours, etc.)）

Various information related to lectures will be posted at the following URL as needed, so please refer to it in a timely manner.
http://www.eh.t.kyoto-u.ac.jp/ja

*Please visit KULASIS to find out about office hours.

Course number	G-ENG13 6H215 LJ60		
Course title (and course title in English)	**機能性界面化学** Chemistry of Functional Interfaces	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SAKKA TETSUO

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

材料の性質は界面に大きく影響される。その中でも光学的な性質は界面に敏感である。このことは、界面を工夫することにより光をより効果的に扱うことができることを意味している同時に、界面を調べる手段として光を使うことが有効であることも意味している。講義の前半では、化学系の学部カリキュラムではあまり取り扱わない光やレーザーに関する基本的事項について解説する。後半では、光が関与するさまざまな界面現象について解説し、物質界面の分光法による研究にどのように利用できるかについて説明する予定である。

[Course objectives]

光が関与する物質界面の多様な現象を理解し、界面を調べるためのさまざまな分光法の原理を理解すること。

[Course schedule and contents]

序論（1回）
・界面と光について

光とレーザーの基礎（5回）
・光の基本的性質
・レーザー

界面現象と光（5回）
・電磁場の境界条件とフレネル式
・表面プラズモンポラリトン
・光高調波発生
・エリプソメトリー
・界面張力波と光散乱

[Course requirements]

None

[Evaluation methods and policy]

筆記試験の結果にもとづいて判定する

[Textbooks]

Not used
授業で資料を配布する

Continue to 機能性界面化学 (2)↓↓↓

機能性界面化学 (2)

[References, etc.]

（Reference books）
大津元一著 『現代光科学Ⅰ、Ⅱ』（朝倉書店）
（前半）大津元一著　「現代光科学Ⅰ、Ⅱ」　朝倉書店
（後半）特になし

[Study outside of class (preparation and review)]

配布資料をもとに復習すること

（Other information (office hours, etc.)）

隔年開講科目

*Please visit KULASIS to find out about office hours.

Course number	G-ENG13 6H218 LJ61		
Course title (and course title in English)	固体触媒設計学 Material Design of Solid Catalysts	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,EGUCHI KOUICHI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

エネルギー、環境及び資源に関する問題は相互に関連しており、人類の将来にとって最も重要な課題のひとつといえる。このような問題と関連する材料技術についての現状と将来課題を理解する。本講義では、エネルギー問題、環境浄化に関連した社会的背景を織り交ぜながら、燃料電池や環境触媒における材料化学の役割を学ぶとともに、そこで使用される金属酸化物を中心とした機能性固体材料、複合材料に求められる性質についての基礎的化学を学習する。

[Course objectives]

・ エネルギーや環境問題にかかわる触媒
・ 燃料電池の化学(特に高温における使用)
・ 機能性固体材料としての固体電解質の科学
・ エネルギー環境問題に関連した無機固体材料の役割

[Course schedule and contents]

エネルギー事情，燃料電池（2回）
燃料電池の現状と化学,固体酸化物形燃料電池，固体電解質の化学

固体電解質と電極反応（2回）
固体電解質と電極反応，酸化物電極材料

不定比性，固体材料の調製法（2回）
ペロブスカイト型酸化物と不定比性，機能性固体材料の調製法

燃料電池の効率（2回）

燃料変換技術（1回）
燃料変換技術と触媒，改質とシフト反応，炭素析出

エネルギーキャリア（2回）
アンモニアのエネルギーキャリアとしての利用

Continue to 固体触媒設計学(2)↓↓↓

固体触媒設計学(2)

[Course requirements]

物理化学，無機固体化学のある程度の知識を前提とする

[Evaluation methods and policy]

試験の成績をもとにし、レポートを課した場合はその内容を加味して、5段階（A+：96-100点／A：85-95点／C：65-74点／D：60-64点／F：60点未満）で評価する。

[Textbooks]

Not used
講義内容に沿った資料を配布する．

[References, etc.]

（Reference books）
特に指定しない．講義中に必要に応じて紹介する

[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.

未更新

Course number	G-ENG13 6H219 LJ60		
Course title (and course title in English)	構造有機化学 Structural Organic Chemistry	Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,MURATA YASUJIROU Institute for Chemical Research Associate Professor,HIROSE TAKASHI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]
,1time,
,2times,
,1time,
,1time,
,1time,
,1time,
,4times,

[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.

未更新

Course number	G-ENG13 5H222 LJ60				
Course title (and course title in English)	物質変換化学 Chemical Transformations		Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,NAKAMURA MASAHARU Institute for Chemical Research Associate Professor,TAKAYA HIKARU	
Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

course guidance and introduction,1time,4/9 course guidance/introduction/assessment test
syntheses, properties, and applications of functional metal nano particles,6times,4/16-5/28 main group organometallics in molecular transformations
syntheses, properties, and applications of organo main group metal compounds,4times,6/4-7/2 transition metal organometallic in photo- and electro-functional materials

[Course requirements]

knowledge of undergraduate organic chemistry

[Evaluation methods and policy]

examinations (quizes in classes and final achievement test)

[Textbooks]

Not fixed

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

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.

未更新

Course number	G-ENG13 6H226 LJ60		
Course title (and course title in English)	錯体触媒設計学 Chemistry of Well-Defined Catalysts	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OHKI YASUHIRO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 錯体触媒設計学(2)↓↓↓

錯体触媒設計学(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG13 5H232 LJ60		
Course title (and course title in English)	物質エネルギー化学特論第五 Energy and Hydrocarbon Chemistry, Adv.V	Instructor's name, job title, and department of affiliation	Part-time Lecturer,SASAMORI TAKAHIRO Graduate School of Engineering Professor,OOE KOUICHI

Target year	1st year students or above	Number of credits	1.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

有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。有機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。

[Course objectives]

有機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。

[Course schedule and contents]

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
１０．X線結晶構造解析の実例・デモンストレーション
１１．確認テストと演習

[Course requirements]

一般的な有機化学に関する知識を有する。

[Evaluation methods and policy]

小テスト50%、レポート課題50%

[Textbooks]

資料を配付する。

[References, etc.]

（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.

未更新

Course number	G-ENG13 7H238 LJ60				
Course title (and course title in English)	放射化学特論 Radiochemistry, Adv.	Instructor's name, job title, and department of affiliation	Institute for Integrated Radiation and Nuclear Science Associate Professor,OKI YUUICHI Institute for Integrated Radiation and Nuclear Science Associate Professor,TAKAMIYA KOUICHI		
Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,2times,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

Course number			
Course title (and course title in English)	有機典型元素化学 Organic Main-Group Element Chemistry	Instructor's name, job title, and department of affiliation	Institute for Integrated Cell-Material Sciences Professor,FUKAZAWA AIKO

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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。

[Course objectives]

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。

[Course schedule and contents]

・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。
・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。
・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。
・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。
・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。
・学修到達度の確認(1) 学習到達度の確認を行う。

[Course requirements]

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。

[Evaluation methods and policy]

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)

[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.

未更新

Course number	G-ENG43 6S204 LJ60		
Course title (and course title in English)	物質エネルギー化学特別セミナー１ Energy and Hydrocarbon Chemistry Special Seminar 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG43 6S205 LJ60		
Course title (and course title in English)	物質エネルギー化学特別セミナー２ Energy and Hydrocarbon Chemistry Special Seminar 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,
,,
,,

[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.

未更新

Course number	G-ENG13 6S206 LJ60		
Course title (and course title in English)	物質エネルギー化学特別セミナー３ Energy and Hydrocarbon Chemistry Special Seminar 3	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG14 6D432 EJ60		
Course title (and course title in English)	分子工学特別実験及演習 I Laboratory and Exercises in Molecular Engineering I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,7times,
,16times,
,7times,

[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.

未更新

Course number	G-ENG14 6D433 EJ60		
Course title (and course title in English)	分子工学特別実験及演習II Laboratory and Exercises in Molecular Engineering II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,7times,
,16times,
,7times,

[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.

Course number	G-ENG14 6D439 LB60		
Course title (and course title in English)	分子工学特論第一A Molecular Engineering, Adv. IA	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

分子工学の各専門分野におけるトピックスについて、コロキウム形式などで学修する。

[Course objectives]

分子工学に関わる基礎的事項と先端研究の内容について理解を深める。

[Course schedule and contents]

分子工学のトピックス（8回）
分子工学の各専門分野におけるトピックスについて、コロキウム形式やレポート作成を通じて学修する。

[Course requirements]

分子工学専攻以外の専攻所属の学生は履修にあたり専攻長に説明を受けること。

[Evaluation methods and policy]

平常点およびレポートにより評価する

[Textbooks]

特になし

[References, etc.]

（Reference books）
特になし

[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.

Course number	G-ENG14 6D445 LB60		
Course title (and course title in English)	分子工学特論第一B Molecular Engineering, Adv. IB	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

分子工学の各専門分野におけるトピックスについて、コロキウム形式などで学修する。

[Course objectives]

分子工学に関わる基礎的事項と先端研究の内容について理解を深める。

[Course schedule and contents]

分子工学のトピックス（8回）
分子工学の各専門分野におけるトピックスについて、コロキウム形式やレポート作成を通じて学修する。

[Course requirements]

分子工学専攻以外の専攻所属学生は、履修にあたり専攻長に説明を受けること。

[Evaluation methods and policy]

平常点およびレポートにより評価する

[Textbooks]

特になし

[References, etc.]

（Reference books）
特になし

[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.

未更新

Course number	G-ENG14 5H401 LJ60

Course title (and course title in English)	統計熱力学 Statistical Thermodynamics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SATO HIROFUMI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Confirm the relationship between thermodynamics and statistical mechanics, and acquire statistical mechanics ideas to understand various phenomena as well.

[Course schedule and contents]

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

[Course requirements]

Knowledge of thermodynamics of undergraduate level and elementary statistical mechanics

[Evaluation methods and policy]

Evaluation will be based on active participation and an examination.

[Textbooks]

Instructed during class

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.

Course number	G-ENG14 5H405 LJ60		
Course title (and course title in English)	量子化学 I Quantum Chemistry I	Instructor's name, job title, and department of affiliation	Fukui Institute for Fundamental Chemistry Professor,SATOU TOORU Graduate School of Engineering Associate Professor,HIGASHI MASAHIRO

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

原子・分子の量子力学、および多体電子系におけるハートリー・フォック理論、ポストハートリー・フォック理論、密度汎関数理論などの理論的手法、軌道相互作用といった量子化学の基礎的事項について講述する。

[Course objectives]

量子化学の基礎とその理解に必要なフレームについて習熟する。

[Course schedule and contents]

線形代数の復習、解析力学（1回）
線形空間、内積、ラグランジュ形式、ハミルトン形式

量子力学の基礎（2回）
ブラ、ケット、オブザーバブル、正準量子化、厳密に解けるいくつかの例

摂動論とその応用（2回）
分極率、磁化率、時間に依存する摂動論

分子の量子力学（2回）
ボルン・オッペンハイマー近似、回転、振動

ハートリー・フォック理論（2回）
多電子系、軌道の概念、フェルミ粒子の反対称性、スレーター行列式、フォック方程式

ポストハートリー・フォック理論（1回）
CI法、MCSCF法、MP法

密度汎関数理論（1回）
Hohenberg-Kohnの定理、Kohn-Sham法

軌道相互作用（1回）
軌道混合、フロンティア軌道理論
学習到達度の確認 1

Continue to 量子化学 I (2)↓↓↓

量子化学Ⅰ(2)

[Course requirements]

学部物理化学で出てくる程度の初等的な量子力学

[Evaluation methods and policy]

平常点及び定期試験に基づく総合判定

[Textbooks]

Not used

[References, etc.]

（Reference books）

J.J. Sakurai 『現代の量子力学』（吉岡書店）
福井謙一 『量子化学』（朝倉書店）
米沢 貞次郎　他 『三訂量子化学入門』（化学同人）
福井謙一 『化学反応と電子の軌道』（丸善）
R.G.Parr, W.Yang 『原子・分子の密度汎関数法』（シュプリンガー）
A. Szabo, N.S. Ostlund 『新しい量子化学ー電子構造の理論入門』（東京大学出版会）

[Study outside of class (preparation and review)]

講義中に指示する。

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG14 7H408 LJ60		
Course title (and course title in English)	分子分光学 Molecular Spectroscopy	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,Shu Seki Graduate School of Engineering Associate Professor,SUGASE KENJI Graduate School of Engineering Associate Professor,SUDA MASAYUKI Graduate School of Engineering Senior Lecturer,Nguyen Thanh Phuc

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

一般的な分光学は，電磁波と物質の相互作用に基づき，変化する電磁波の様子をそのエネルギーや運動量、もしくは特別な変数である時間の関数として実験的に解き明かすうえでの原理から方法論までを指す．広い意味では，物質に対しエネルギーの摇動を加え，散逸する過程に関する全容を知ることとも言えよう．本講義では，さまざまな摇動源に対して，物質がどのように応答し，散逸過程におけるどのような情報を引き出すことができるのかについて，講義または演習を行う．

“ Spectroscopy ” is, in general, based on the fundamentals of electromagnetic waves interaction with the matter where we often use “ photons ” as a probe and deduce the mechanisms in the interactions as functions of energy, momentum, and/or time as one special variable. Till date, “ Spectroscopy ” has been extended to the wider range of “ probes ” than electromagnetic waves, and defined as a comprehensive study on energy dissipation processes against energetic stimuli to the matters by the probes. Herein we discuss on 1) how the probes interact with the matter, 2) how the energy dissipate in the matter, and 3) what kind of information we can deduce by the spectroscopy techniques.

[Course objectives]

本年度は，特に下記に示した分光法とそれぞれに用いられる分光プローブに着目し，１）それぞれのプローブと物質の相互作用の基礎過程，２）エネルギー散逸構造とその先，３）実際にそれぞれの分光法によって引き出される情報，について理解することを目標とする．

This year we focus particularly on the following spectroscopy techniques based on respective “ probes ”, and expect to understand 1) interaction protocols, 2) energy dissipation pathways and fates, and 3) practical outcomes form respective spectroscopy techniques.

分光法各論：
１）コヒーレント多次元分光：分子環境とカップリングのダイナミクスの検出
２）NMRの基礎理論および光や流れなどの摂動を測定試料に与えた非平衡系におけるNMR測定などについての講義
３）固体物性科学で用いられる主としてX線からテラヘルツ波領域における各種表面・界面分光についての講義
４）マイクロ波誘電損失分光法と物質の複素誘電率・伝導率： 1-100 GHz**のマイクロ波と物質の相互作用を中心に**

Spectroscopy Techniques and Probes：:
1) Coherent multidimensional spectroscopy: probing molecular environment and coupling dynamics

Continue to 分子分光学(2)↓↓↓

分子分光学(2)

2) Lecture on the basic theory of NMR and NMR measurements in non-equilibrium systems where the sample is subjected to perturbations such as light and flow.
3) Lecture on various surface and interface spectroscopies in the X-ray to terahertz wave region to understand solid　state physical properties.
4) Understanding of dielectric-loss spectroscopy of the matters: A interaction of electromagnetic waves ranging 1-100 GHz with organic materials

[Course schedule and contents]

第1回： コヒーレント多次元分光（CMDS）の基礎
第2回： CMDSの応用１：分子環境のダイナミクスの検出
第3回： CMDSの応用２：カップリングのダイナミクスの検出
第4回： NMRの基礎
第5回： タンパク質のNMR
第6回： NMRによる動的構造解析
第7回： 非平衡系におけるNMR法
第8回： 固体の構造解析のためのX線・赤外分光
第9回： 固体の電子構造理解のための光電子分光
第10回： 強相関物性・スピン物性理解のための各種分光法
第11回：電子/スピン輸送とその完全非破壊・非接触・実験的解析法

1. Basics of coherent multidimensional spectroscopy (CMDS)
2. Application of CMDS 1: probing molecular environment dynamics
3. Application of CMDS 2: probing coupling dynamics
4. Fundamentals of NMR
5. Protein NMR spectroscopy
6. Analysis of structural dynamic by NMR
7. NMR spectroscopy in nonequilibrium systems
8. X-ray and infrared spectroscopies for structural analysis of solids
9. Photoelectron spectroscopies to study electronic structures of solids
10. Various spectroscopies to study strongly correlated materials and spintronic materials
11. Electron/Spin transport in matters and full-experimental non-contact measurement techniques

[Course requirements]

学部レベルの化学の知識

[Evaluation methods and policy]

各項目の担当教員の課すレポートや小テスト等の結果を総合して判定する。
１００点満点。

[Textbooks]

Not used

Continue to 分子分光学(3)↓↓↓

分子分光学(3)

[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

Shaul Mukamel 『Principles of Nonlinear Optical Spectroscopy』（Oxford University Press, 1995）ISBN: 0-19-509278-3

[Study outside of class (preparation and review)]

講義中に指示する。

（Other information (office hours, etc.)）

隔年開講科目。
オフィスアワーは原則として授業終了後の当日午後を予定。

*Please visit KULASIS to find out about office hours.

Course number	G-ENG14 6H416 LJ60　G-ENG14 6H416 LE60		
Course title (and course title in English)	分子触媒学 Catalysis Science at Molecular Level	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TANAKA TSUNEHIRO Graduate School of Engineering Associate Professor,TERAMURA KENTARO

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Scattering theory of an electron for XAFS Analysis and Introduction to Catalytic Science.
The lectures are delivered online.

[Course objectives]

Learning fundamentals of catalytic science and acquiring elementary scattering theory to understand XAFS spectroscopy as a powerful tool for catalyst characterization.

[Course schedule and contents]

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 questios 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.

未更新

Course number	G-ENG14 7H422 LJ61		
Course title (and course title in English)	分子材料科学 Molecular Materials Science	Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,KAJI HIRONORI Institute for Chemical Research Assistant Professor,SHIZU KATSUYUKI Institute for Chemical Research Assistant Professor,SUZUKI KATSUAKI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 分子材料科学(2)↓↓↓

分子材料科学(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG14 7H427 LJ61		
Course title (and course title in English)	量子物質科学 Quantum Materials Science	Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,MIZUOCHI NORIKAZU

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
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,1time,
,1time,
,1time,
,4times,
,1time,

[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.

未更新

Course number	G-ENG14 7H428 LB61

Course title (and course title in English)	分子レオロジー Molecular Rheology	Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,WATANABE HIROSHI Institute for Chemical Research Associate Professor,MATSUMIYA YUMI

Target year		Number of credits	1.5	Year/semesters	2021/First semester

Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

Lecture is given for the rheology and dynamics of polymeric liquids and their molecular basis.

[Course objectives]

Understanding phenomenological aspect of rheology in general and molecular aspect of polymer rheology.

[Course schedule and contents]

Basics of Rheology,1time,Rheology and its role in science and engineering, flow / deformation/ stress, viscosity, modulus
Rheological behavior of matter,1time,Rheological behavior of matter and classification, viscoelasticity, non-Newtonian flow, plastic flow
Viscoelastic relaxations,2times,Boltzmann's principle, relaxation functions, relaxation time, conversion among response functions, complex modulus
Viscoelasticity and temperature,1time,Glass transition, time-temperature superposition, WLF equation
Stress expression of polymers,2times,Stress expression, tension / free-energy / distribution-function of subchains
Rouse/Zimm model,1time,Model description, model equation, derivation of stress and relaxation modulus, discussion on the relaxation behavior
tube model,2times,Model description, model equation, derivation of stress and relaxation modulus, discussion on the relaxation behavior, comparison to Rouse dynamics
feedback of evaluation and confirmation of level of understanding,1time,Feedback of evaluation of report etc, and confirmation of level of understanding

[Course requirements]

Some basics on differential equations and statistical physics of polymers

[Evaluation methods and policy]

Mainly with report

[Textbooks]

Original text will be distributed in the class

[References, etc.]

（Reference books）

Y Matsushita ed, Structure and Property of Polymers (Kodansha) M Doi amp S F Edwards The Theory of

Continue to 分子レオロジー(2)↓↓↓

分子レオロジー(2)

Polymer Dynamics (Oxford press) W Graessley Polymeric Liquids amp Networks: Dynamics and Rheology (Garland Science)

（Related URLs）

(http://rheology.minority.jp)

[Study outside of class (preparation and review)]

Differential equations are used for molecular description of the time evolution of polymer chains that governs the rheological properties. It is required to re-visit the content for the under-grad level of differential equation.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG14 6H430 LE61		
Course title (and course title in English)	分子細孔物理化学 Molecular Porous Physical Chemistry	Instructor's name, job title, and department of affiliation	Institute for Advanced Study Professor,SIVANIAH，Easan Institute for Advanced Study Program-Specific Associate Professor,Ghalei, Behnam

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

This course will discuss the physical chemistry and engineering application of porous materials in the areas of adsorption and membrane separation processes.

[Course objectives]

The intention of this course is to allow students to become familiar with a range of porous materials, and the practical ways such materials are used. Although the course is not intended to be exhaustive in covering all porous materials and all applications, examples will be followed that are relevant to socially important problems, such as global warming, or water shortage.

[Course schedule and contents]

Overview **1** Introduction to course, and broad overview of porous materials
Thermodynamics of Mixing **2** Phase equilibria and structure formation processes
Adsorptive processes **2** Physical chemistry of adsorptive processes in porous materials
Diffusive processes **2** Physical chemistry of diffusion limited processes in porous materials
Case Study: Membrane Processes for liquid separation **2** Liquid filtration systems for nanofiltration, desalination
Case Study: Membrane Processes for gas separation **2** Case Study: Membrane Processes for gas separation

[Course requirements]

None

[Evaluation methods and policy]

The course grade will be determined based on class performance/attendance (40%) and a final report(60%).

[Textbooks]

Not used

Continue to 分子細孔物理化学(2)↓↓↓

分子細孔物理化学(2)

[References, etc.]

（Reference books）

Introduced during class
To be announced during class

（Related URLs）

http://pureosity.org/en/

[Study outside of class (preparation and review)]

To be announced during class

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG14 6H430 LE61		
Course title (and course title in English)	Molecular Porous Physical Chemistry Molecular Porous Physical Chemistry	Instructor's name, job title, and department of affiliation	Institute for Advanced Study Professor,SIVANIAH，Easan

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

This course will discuss the physical chemistry and engineering application of porous materials in the areas of adsorption and membrane separation processes.

[Course objectives]

The intention of this course is to allow students to become familiar with a range of porous materials, and the practical ways such materials are used. Although the course is not intended to be exhaustive in covering all porous materials and all applications, examples will be followed that are relevant to socially important problems, such as global warming, or water shortage.

[Course schedule and contents]

Overview **1** Introduction to course, and broad overview of porous materials
Thermodynamics of Mixing **2** Phase equilibria and structure formation processes
Adsorptive processes **2** Physical chemistry of adsorptive processes in porous materials
Diffusive processes **2** Physical chemistry of diffusion limited processes in porous materials
Case Study: Membrane Processes for liquid separation **2** Liquid filtration systems for nanofiltration, desalination
Case Study: Membrane Processes for gas separation **2** Case Study: Membrane Processes for gas separation

[Course requirements]

None

[Evaluation methods and policy]

The course grade will be determined based on class performance/attendance (40%) and a final report(60%).

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class
To be announced during class

[Study outside of class (preparation and review)]

To be announced during class

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG14 7H436 LJ60		
Course title (and course title in English)	分子工学特論第三 Molecular Engineering, Adv. III	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	1.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5.5times,
,5.5times,
,5.5times,

[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.

Course number	G-ENG14 6P416 LJ60		
Course title (and course title in English)	分子触媒学続論 Catalysis Science at Molecular Level 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TANAKA TSUNEHIRO Graduate School of Engineering Associate Professor,TERAMURA KENTARO

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Lectures on various inorganic syntheses an characterization of inorganic materials are given mainly by Professor Saburo Hosokawa. In addition, application of inorganic materials to heterogeneous catalyst is described.

[Course objectives]

Learning the fundamentals of catalyst preparation and the method for structural analysis of catalyst materials

[Course schedule and contents]

1 Synthesis methods of inorganic materials(1)
co-precipitation method; polymerized complex method; solvothermal methd

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.

[Course requirements]

None

[Evaluation methods and policy]

Submission of report assignment.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Instrucions will be given as necessary.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG14 7P440 LJ60		
Course title (and course title in English)	分子工学特論第七 Molecular Engineering, Adv. VII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Understanding of interaction between electromagnetic wave and matter

This series of lectures are given by Dr. Yusuke Tsutsui in 2021.
This course concerns theory and practice in interaction between electromagnetic wave and matter with wide range of time-frequency domain, which is necessary to describe dynamics of matter, especially on molecular engineering. The advanced measurement techniques will be explained in the final stage on this course.

[Course objectives]

[Course schedule and contents]

1st: Frequency of electromagnetic wave and related phenomena
2nd: Classical/quantum treatment 1
3rd: Classical/quantum treatment 2
4th: Advanced techniques in recent researches

[Course requirements]

None

[Evaluation methods and policy]

Evaluation will be based on active participation and individual reports.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Making a report on the theme of the lectures.

（Other information (office hours, etc.)）

No office hour. Anytime one can contact with Dr. Tsutsui via internet.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG44 6S401 LJ60		
Course title (and course title in English)	分子工学特論 Advanced Molecular Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,
,,

[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.

未更新

Course number	G-ENG44 7S404 SJ60		
Course title (and course title in English)	分子工学特別セミナー１ Advanced Seminar on Molecular Engineering 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG44 7S404 SJ60

Course title (and course title in English)	分子工学特別セミナー２ Advanced Seminar on Molecular Engineering 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,IMAHORI HIROSHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG15 6D640 EJ61		
Course title (and course title in English)	高分子化学特別実験及演習 Polymer Chemistry Laboratory & Exercise	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOKITA HIDEO

Target year		Number of credits	8	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,60times,

[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.

Course number	G-ENG15 5D652 LJ61		
Course title (and course title in English)	高分子物性 Polymer Physical Properties	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	3	Year/semesters	2021/First semester
Days and periods	Thu.1,2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

A concise explanation is given of physical properties of polymer solutions and polymeric solids along with relevant basic theories.

[Course objectives]

Fundamental knowledge of physical properties of polymer materials.

[Course schedule and contents]

Polymer Chain Conformation in Dilute Solutions,4times,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 functions of molecular weight is considered based on the chain models.
Thermodynamics and Phase Behavior of Polymer Solutions,4times,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.
Exercise,1time,Exercise in polymer solutions.
Structure and Mechanical Properties of Polymeric Solids,5times,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.
Electronic and Optical Properties of Polymeric Solids,5times,The electronic and optical properties of polymers is reviewed. The application of polymer materials in the opto-electronics and display devices is also presented.
Exercise,1time,Exercise in polymeric solids.

[Course requirements]

Fundamental knowledge of physical chemistry.

Continue to 高分子物性(2)↓↓↓

高分子物性(2)

[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.

未更新

Course number	G-ENG15 6H607 LJ61		
Course title (and course title in English)	**高分子生成論** Design of Polymerization Reactions	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOUCHI MAKOTO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,2times,
,3times,

[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.

未更新

Course number	G-ENG15 6H610 LJ61		
Course title (and course title in English)	反応性高分子 Reactive Polymers	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,TANAKA KAZUO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 反応性高分子(2)↓↓↓

反応性高分子(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG15 6H611 LJ61		
Course title (and course title in English)	生体機能高分子 Biomacromolecular Science	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AKIYOSHI KAZUNARI Graduate School of Engineering Associate Professor,YOSHIHIRO SASAKI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

, 5 times,
, 3 times,
, 3 times,

[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.

Course number	G-ENG15 6H613 LJ61		
Course title (and course title in English)	高分子機能学 Polymer Structure and Function	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOKITA HIDEO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

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.

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.

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.

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.

未更新

Course number	G-ENG15 6H616 LJ61		
Course title (and course title in English)	高分子集合体構造 Polymer Supermolecular Structure	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKENAKA MIKIHITO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 stuctures of block copolymers, etc.

[Course schedule and contents]

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.

[Course requirements]

Thermodynamics preferable.

Continue to 高分子集合体構造(2)↓↓↓

高分子集合体構造(2)

[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.

未更新

Course number	G-ENG15 6H622 LJ61		
Course title (and course title in English)	高分子基礎物理化学 Fundamental Physical Chemistry of Polymers	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOGA TSUYOSHI Graduate School of Engineering Associate Professor,NISHIDA KOUJI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understanding the molecular mechanism of characteristic physical properties of polymeric systems based on the equilibrium and non-equilibrium statistical mechanics.

[Course schedule and contents]

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

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

未更新

Course number	G-ENG15 6H628 LJ61　G-ENG15 6H628 LE61		
Course title (and course title in English)	高分子材料設計 Design of Polymer Materials	Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,TSUJII YOSHINOBU Institute for Chemical Research Associate Professor,OONO KOUJI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

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

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 高分子材料設計(2)↓↓↓

高分子材料設計(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG15 6H636 LJ61		
Course title (and course title in English)	医薬用高分子設計学 Polymer Design for Biomedical	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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。

[Course objectives]

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。

[Course schedule and contents]

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。

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。

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。

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、材料の研究方法と設計方法を学ぶ。

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、材料の研究方法と設計方法を学ぶ。

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。

Continue to 医薬用高分子設計学(2)↓↓↓

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、材料の研究方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とを組み合わせて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.

未更新

Course number	G-ENG15 6H643 LJ61		
Course title (and course title in English)	高分子溶液学 Polymer Solution Science	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NAKAMURA YOU Graduate School of Engineering Associate Professor,IDA DAICHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

Review,1time,Definitions of physical quantities determined from the light scattering and viscosity measurements and the theoretical formulations of those quantities.
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.
Excluded-volume effects,2times,Intra- and intermolecular excluded-volume effects represented by the expansion factors and the second virial coefficient, respectively.
Steady-state transport properties,2times,A comparison of experimental data for the intrinsic viscosity and diffusion coefficient with relevant theories.
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.

[Course requirements]

Basic knowledge of polymer solutions given in the lecture Polymer Physical Properties (10D651).

[Evaluation methods and policy]

Term-end examination.

[Textbooks]

Lecture note distributed in the class.

[References, etc.]

（Reference books）

Continue to 高分子溶液学(2)↓↓↓

高分子溶液学(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG15 6H647 LJ61		
Course title (and course title in English)	高分子制御合成 Polymer Controlled Synthesis	Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,YAMAGO SHIGERU Institute for Chemical Research Associate Professor,TOSAKA MASATOSHI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,2times,
,1time,
,1time,
,4times,

[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.

未更新

Course number	G-ENG15 5H649 LJ61		
Course title (and course title in English)	**高分子合成** Polymer Synthesis	Instructor's name, job title, and department of affiliation	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 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

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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Continue to 高分子合成(2)↓↓↓

高分子合成(2)

[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.

未更新

Course number	G-ENG44 6H651 LJ61				
Course title (and course title in English)	高分子生成論特論 Design of Polymerization Reactions, Adv.		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOUCHI MAKOTO	
Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,2times,
,3times,

[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.

未更新

Course number	G-ENG44 6H652 LJ61		
Course title (and course title in English)	反応性高分子特論 Reactive Polymers, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,TANAKA KAZUO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

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.

未更新

Course number	G-ENG44 6H653 LJ61		
Course title (and course title in English)	生体機能高分子特論 Biomacromolecular Science, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AKIYOSHI KAZUNARI Graduate School of Engineering Associate Professor,YOSHIHIRO SASAKI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

, 5 times,
, 3 times,
, 3 times,

[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.

Course number	G-ENG44 6H654 LJ61		
Course title (and course title in English)	高分子機能学特論 Polymer Structure and Function, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOKITA HIDEO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

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.

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.

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.

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.

未更新

Course number	G-ENG44 6H655 LJ61		
Course title (and course title in English)	高分子溶液学特論 Polymer Solution Science, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,NAKAMURA YOU Graduate School of Engineering Associate Professor,IDA DAICHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

Review,1time,Definitions of physical quantities determined from the light scattering and viscosity measurements and the theoretical formulations of those quantities.
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.
Excluded-volume effects,2times,Intra- and intermolecular excluded-volume effects represented by the expansion factors and the second virial coefficient, respectively.
Steady-state transport properties,2times,A comparison of experimental data for the intrinsic viscosity and diffusion coefficient with relevant theories.
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.

[Course requirements]

Basic knowledge of polymer solutions given in the lecture Polymer Physical Properties (10D651).

[Evaluation methods and policy]

Term-end examination.

[Textbooks]

Lecture note distributed in the class.

[References, etc.]

（Reference books）

Continue to 高分子溶液学特論(2)↓↓↓

高分子溶液学特論(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG44 6H656 LJ61		
Course title (and course title in English)	高分子基礎物理化学特論 Physical Chemistry of Polymers, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOGA TSUYOSHI Graduate School of Engineering Associate Professor,NISHIDA KOUJI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understanding the molecular mechanism of characteristic physical properties of polymeric systems based on the equilibrium and non-equilibrium statistical mechanics.

[Course schedule and contents]

phase separation of polymer solutions and mixtures,2times,phase diagram, Flory-Huggins theory, mean-field theory, phase separation, spinodal decomposition
microphase separation of block copolymers,1time,microphase separation, density functional theory, directed self-assembly
gelation,1time,definition of gels, classification of gels, classical theory of gels, sol-gel transition, elastically effective chains
rubber elasticity,3times,affine network theory, phantom network theory, tetra-PEG gel, slide-ring gel
rheology of associating polymers,3times,telechelic associating polymers, linear viscoelasticity, Maxwell model, shear thickening, transient network theory, colloid/polymer mixture, shear-induced gel
verification of understanding,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

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.

未更新

Course number	G-ENG44 6H658 LJ61				
Course title (and course title in English)	**高分子集合体構造特論** Polymer Supermolecular Structure, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKENAKA MIKIHITO		
Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 stuctures of block copolymers, etc.

[Course schedule and contents]

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.

[Course requirements]

Thermodynamics preferable.

Continue to 高分子集合体構造特論(2)↓↓↓

高分子集合体構造特論(2)

[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.

未更新

Course number	G-ENG44 6H659 LJ61		
Course title (and course title in English)	高分子材料設計特論 Design of Polymer Materials, Adv.	Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,TSUJII YOSHINOBU Institute for Chemical Research Associate Professor,OONO KOUJI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

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

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 高分子材料設計特論(2)↓↓↓

高分子材料設計特論(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG44 6H660 LJ61		
Course title (and course title in English)	高分子制御合成特論 Polymer Controlled Synthesis, Adv.	Instructor's name, job title, and department of affiliation	Institute for Chemical Research Professor,YAMAGO SHIGERU Institute for Chemical Research Associate Professor,TOSAKA MASATOSHI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,2times,
,1time,
,1time,
,4times,

[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.

Course number	G-ENG44 6H661 LJ61		
Course title (and course title in English)	医薬用高分子設計学特論 Polymer Design for Biomedical and Pharmaceutical Applications, Adv.	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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。

[Course objectives]

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。

[Course schedule and contents]

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。

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。

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。

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、材料の研究方法と設計方法を学ぶ。

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、材料の研究方法と設計方法を学ぶ。

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。

Continue to 医薬用高分子設計学特論(2)↓↓↓

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、材料の研究方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とを組み合わせて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.

未更新

Course number	G-ENG15 6H662 LJ61		
Course title (and course title in English)	先端機能高分子 Developments in Polymer Assembly and Functionality	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUOKA HIDEKI Graduate School of Engineering Senior Lecturer,LANDENBERGER, Kira Beth

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,2times,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

未更新

Course number	G-ENG15 6H663 LJ61		
Course title (and course title in English)	生命医科学 Life and Medical Sciences	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,EIRAKU GENJI Institute for Frontier Life and Medical Sciences Associate Professor,OHGUSHI MASATOSHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,3times,
,4times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG44 6H664 LJ61		
Course title (and course title in English)	先端機能高分子特論 Developments in Polymer Assembly and Functionality, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUOKA HIDEKI Graduate School of Engineering Senior Lecturer,LANDENBERGER, Kira Beth

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,2times,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

未更新

Course number	G-ENG44 6H665 LJ61		
Course title (and course title in English)	生命医科学特論 Life and Medical Sciences, Adv.	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,EIRAKU GENJI Institute for Frontier Life and Medical Sciences Associate Professor,OHGUSHI MASATOSHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,3times,
,4times,
,2times,
,1time,

[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.

Course number					
Course title (and course title in English)	高分子科学セミナーI Polymer Science Seminor I		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOKITA HIDEO	
Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style		Language of instruction	Japanese and English

[Overview and purpose of the course]

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。

[Course objectives]

高分子化学の歴史、さらに最近の進歩を理解する。

[Course schedule and contents]

高分子合成・材料に関するセミナー(15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。

[Course requirements]

None

[Evaluation methods and policy]

発表を課し、担当教員によって理解度、ディスカッション力、発表能力を評価する。

[Textbooks]

Not used

[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.

Course number	

Course title (and course title in English)	高分子科学セミナーII Polymer Science Seminor II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOKITA HIDEO

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, Second semester

Days and periods	Intensive	Class style		Language of instruction	Japanese

[Overview and purpose of the course]

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。

[Course objectives]

高分子化学の歴史、さらに最近の進歩を理解する。

[Course schedule and contents]

高分子物性に関するセミナー(15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。

[Course requirements]

None

[Evaluation methods and policy]

発表を課し、担当教員によって理解度、ディスカッション力、発表能力を評価する。

[Textbooks]

Not used

[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.

未更新

Course number	G-ENG45 6S604 LJ61				
Course title (and course title in English)	高分子化学特別セミナー１ Advanced Seminar on Polymer Chemistry 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOKITA HIDEO		
Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG45 6S605 LJ61

Course title (and course title in English)	高分子化学特別セミナー２ Advanced Seminar on Polymer Chemistry 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOKITA HIDEO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG16 7D828 EJ60		
Course title (and course title in English)	合成・生物化学特別実験及演習 Special Experiments and Exercises Synthetic Chemistry and Biological Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGOSHI TOMOKI

Target year		Number of credits	8	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,
,15times,
,15times,

[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.

Course number	G-ENG16 5D839 LJ60		
Course title (and course title in English)	合成・生物化学特論A Synthetic Chemistry and Biological Chemistry, Adv,A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGOSHI TOMOKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

合成・生物化学関連分野の最新の話題を、学外非常勤講師のリレー講義により解説し、合成・生物化学に関連する幅広い領域についての知見を得る.

[Course objectives]

合成・生物化学に関わる基礎的事項と先端研究の内容について理解を深める。

[Course schedule and contents]

合成・生物化学関連講義(15)
合成・生物化学関連分野の最新の話題に関する講義

[Course requirements]

None

[Evaluation methods and policy]

平常点およびレポートにより評価する。

[Textbooks]

特になし

[References, etc.]

（Reference books）
特になし

[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.

Course number	G-ENG16 5D841 LJ60		
Course title (and course title in English)	合成・生物化学特論C Synthetic Chemistry and Biological Chemistry, Adv,C	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGOSHI TOMOKI

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

合成・生物化学の関連重要分野について、学外非常勤講師による集中講義により詳説する。

[Course objectives]

合成・生物化学に関わる基礎的事項と先端研究の内容について理解を深める。

[Course schedule and contents]

合成・生物化学関連講義(7.5回)
合成・生物化学の関連重要分野について、集中講義により詳説する。

[Course requirements]

None

[Evaluation methods and policy]

平常点およびレポートにより評価する。

[Textbooks]

特になし

[References, etc.]

（Reference books）
特になし

[Study outside of class (preparation and review)]

必要に応じて指示する。

（Other information (office hours, etc.)）

隔年開講

*Please visit KULASIS to find out about office hours.

Course number	G-ENG16 5D843 LJ60		
Course title (and course title in English)	合成・生物化学特論E Synthetic Chemistry and Biological Chemistry, Adv,E	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGOSHI TOMOKI

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

合成・生物化学の関連重要分野について、学外非常勤講師による集中講義により詳説する。

[Course objectives]

合成・生物化学に関わる基礎的事項と先端研究の内容について理解を深める。

[Course schedule and contents]

合成・生物化学関連講義 7.5合成・生物化学の関連重要分野について、集中講義により詳説する。

[Course requirements]

None

[Evaluation methods and policy]

平常点およびレポートにより評価する。

[Textbooks]

特になし

[References, etc.]

（Reference books）

特になし

[Study outside of class (preparation and review)]

必要に応じて指示する。

（Other information (office hours, etc.)）

隔年開講科目

*Please visit KULASIS to find out about office hours.

Course number	G-ENG16 6H802 LJ60

Course title (and course title in English)	有機設計学 Organic System Design	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGINOME MICHINORI Graduate School of Engineering Associate Professor,OOMURA TOSHIMICHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

有機触媒反応の設計と触媒反応の合成化学的な利用を理解するため，触媒的不斉反応を取り上げ，その概説とともに有機ホウ素化合物を用いた不斉反応を例として挙げながら解説する。

[Course objectives]

キラル触媒を用いた不斉触媒反応の原理と，有機合成化学への応用における意義を理解する。

[Course schedule and contents]

不斉合成の概観・基礎(1回)
不斉合成の基本的事項（光学分割法、エナンチオ選択的反応）について概説する。

不斉合成の各論：遷移金属触媒反応(4回)
キラル配位子と有機金属化合物を用いる触媒的不斉反応について詳述する。(1)キラル遷移金属触媒を用いた不斉水添及び関連反応，(2)ホウ素を含んだσ結合の炭素ー炭素多重結合への不斉付加反応，(3)クロスカップリングによる不斉炭素―炭素結合形成，(4)不斉共役付加反応，を取り上げる。

不斉合成の各論：有機触媒反応(2回)
キラル有機触媒を用いる触媒的不斉反応について詳述する。(1)不斉求核触媒，エナミン形成触媒，およびイミニウム形成触媒，(2)キラル相間移動触媒およびキラルブレンステッド酸触媒，を取り上げる。

不斉合成の各論：不斉触媒反応の新しいコンセプト(2回)
不斉触媒反応に関する最近のトピックスを解説する。(1)不斉増幅を伴う不斉触媒反応，動的キラリティ，(2)エナンチオ収束反応，ジアステレオマーの不斉自在合成，を取り上げる。

不斉合成の各論：不斉触媒反応開発の最前線(1回)
不斉触媒反応の開発研究における最新の成果を解説する。

全体のまとめ(1回)
不斉合成の概観および展望を総括する。

[Course requirements]

None

Continue to 有機設計学(2)↓↓↓

有機設計学(2)

[Evaluation methods and policy]

成績の判定は試験の成績に平常点を加味して行う。

[Textbooks]

Not used

[References, etc.]

（Reference books）

『ウォーレン有機化学（下）』（東京化学同人）

Clayden, Greeves, and Warren 『Organic Chemistry, Second Edition』（OXFORD）

E. L. Eliel, S. H. Wilen 『Stereochemistry of Organic Compounds』（Wiley）

A. Koskinen 『Asymmetric Synthesis of Natural Products』（Wiley）

I. Ojima Ed. 『Catalytic Asymmetric Synthesis』（Wiley）

R. Noyori 『Asymmetric Catalysis in Organic Synthesis』（Wiley）

野依良治他 『大学院講義有機化学』（東京化学同人）

[Study outside of class (preparation and review)]

必要に応じて指示する

（Other information (office hours, etc.)）

隔年開講科目。

*Please visit KULASIS to find out about office hours.

Course number	G-ENG16 5H804 LJ61		
Course title (and course title in English)	有機合成化学 Synthetic Organic Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,NAGAKI AIICHIROU

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

受講生の発表とそれに対する解説を通じて、有機合成反応の高度制御法に重点をおいて、有機合成法の最新の進展を系統的に整理するとともに、その将来の展望を論ずる。

[Course objectives]

有機合成反応の高度制御のための各種方法論の特長や適用範囲を理解し、実際の有機合成に活かせる力を身につける。

[Course schedule and contents]

導入(1回)
有機合成化学の現状および講義の進め方について解説する。

酸化反応(3回)
PCC酸化、Swern酸化、オゾン酸化、Wacker酸化、香月－Sharpless不斉エポキシ化など代表的な酸化反応についてその基本的原理を解説するとともに、いくつかの合成への応用例を紹介する

還元反応(2回)
接触還元、Birch還元、ヒドリド還元、Wolf-Kishner還元など代表的な還元反応についてその基本的原理を解説するとともに、いくつかの合成への応用例を紹介する。

炭素－炭素結合形成反応(3回)
有機リチウム反応やGrignard反応、Wittig反応、オレフィンメタセシス、Dields-Alder反応、1,3-双極子付加、Friedel-Crafts反応など代表的な炭素－炭素結合形成反応についてその基本的原理を解説するとともに、いくつかの合成への応用例を紹介する。

新手法(2回)
有機触媒、フロー化学、コンビナトリアル化学など有機合成の最新の手法について、その基本原理を解説するとともに、いくつかの応用例を紹介する。

[Course requirements]

None

Continue to 有機合成化学(2)↓↓↓

有機合成化学(2)

[Evaluation methods and policy]

発表と発表資料をもとに総合的に評価する。

[Textbooks]

特になし

[References, etc.]

（Reference books）
有機合成化学協会編 『トップドラッグから学ぶ創薬化学』（東京化学同人2012）

[Study outside of class (preparation and review)]

必要に応じて指示する

（Other information (office hours, etc.)）

隔年開講科目。

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG16 5H808 LJ61		
Course title (and course title in English)	物理有機化学 Physical Organic Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUDA KENJI Graduate School of Engineering Senior Lecturer,HIGASHIGUCHI KENJI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Thu.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Properties of organic compounds, such as electric conductivity, magnetism, photophysical properties, are discussed in terms of molecular structure and electronic structure.

[Course objectives]

The goal of this course is to understand principles of photochemistry.

[Course schedule and contents]

Photochemical Reaction(1)
Photochemistry, Photophysics, einstein (unit), Jablonski diagram, Excitation, Internal conversion, Intersystem crossing, Fluorescence, Phosphorescence, Photochemical reaction

Excited States in Molecular Orbital Theory(2)
Born-Oppenheimer approximation, Flanck-Condon principle, Singlet, Triplet, Energy gap, n-pi*, pi-pi*, Potential energy surface, Conical intersection, Solvatochromism

Electronic Transition(2)
Transition probability, Fermi's golden rule, Transition moment, Oscillator strength, Polarized light, Stimulated emission, Einstein coefficient, Beer-Lambert law, Selection rule, Spin-orbit coupling

Radiative Transition(2)
Fluorescence, Phosphorescence, Fluorescence excitation spectrum, Mirror relationship, Vibrational structure, Fluorescence quantum yield, Emission rate constant

Behavior of the Excited Molecule(2)
Energy Transfer, Quenching, Trivial, Foerster, Dexter, FRET, Stern-Volmer plot, Excimer, Exciplex, Triplet sensitization

Phororeaction, Photoisomerization(2)
Quantum yield, Photochromism, Conversion in photoisomerization

[Course requirements]

None

Continue to 物理有機化学(2)↓↓↓

物理有機化学(2)

[Evaluation methods and policy]

Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

The basic knowledge of quantum mechanics is prerequisite for this class, so we recommend to review it before the class.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG16 5H816 LE68		
Course title (and course title in English)	生物工学 Microbiology and Biotechnology	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ATOMI HARUYUKI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

This lecture will introduce the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. Commonly used tools in the fields of biochemistry, molecular biology and genetics will also be discussed. In addition, methods to utilize cells and their enzymes in biotechnology will be introduced. Lectures will be given in English, with the aim to improve communication/discussion skills.

[Course objectives]

Basic knowledge on the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. An understanding of the commonly used tools in the fields of biochemistry, molecular biology and genetics as well as methods to utilize cells and their enzymes in biotechnology. Lectures will be given in English, with the aim to improve communication/discussion skills.

[Course schedule and contents]

Introduction 1 Diversity of life, classification of organisms, structure and function of fundamental biomolecules.
Basic mechanisms to sustain life 3 Strategies to conserve energy, biosynthesis, cell division, cell differentiation.
Strategies to adapt to environmental conditions 2 Effect of environmental conditions on cells and biomolecules, thermophiles, acidophiles and their enzymes.
Protein engineering 2 Methods to study enzymes and enzyme reactions, methods to enhance their performance.
Cell engineering 2 Methods utilized in metabolic engineering, cell surface engineering, synthetic biology.
Topic discussion 1 Particular topics will be chosen for discussion

[Course requirements]

None

[Evaluation methods and policy]

Grading will be based on presentations (60%) and attendance (40%).

Continue to 生物工学(2)↓↓↓

生物工学(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.

未更新

Course number	G-ENG52 5H817 LE61		
Course title (and course title in English)	Microbiology and Biotechnology Microbiology and Biotechnology	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ATOMI HARUYUKI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

This lecture will introduce the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. Commonly used tools in the fields of biochemistry, molecular biology and genetics will also be discussed. In addition, methods to utilize cells and their enzymes in biotechnology will be introduced. Lectures will be given in English, with the aim to improve communication/discussion skills.

[Course objectives]

Basic knowledge on the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. An understanding of the commonly used tools in the fields of biochemistry, molecular biology and genetics as well as methods to utilize cells and their enzymes in biotechnology. Lectures will be given in English, with the aim to improve communication/discussion skills.

[Course schedule and contents]

Introduction 1 Diversity of life, classification of organisms, structure and function of fundamental biomolecules.
Basic mechanisms to sustain life 3 Strategies to conserve energy, biosynthesis, cell division, cell differentiation.
Strategies to adapt to environmental conditions 2 Effect of environmental conditions on cells and biomolecules, thermophiles, acidophiles and their enzymes.
Protein engineering 2 Methods to study enzymes and enzyme reactions, methods to enhance their performance.
Cell engineering 2 Methods utilized in metabolic engineering, cell surface engineering, synthetic biology.
Topic discussion 1 Particular topics will be chosen for discussion

[Course requirements]

None

[Evaluation methods and policy]

Grading will be based on presentations (60%) and attendance (40%).

Continue to Microbiology and Biotechnology(2)↓↓↓

Microbiology and Biotechnology(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.

未更新

Course number	G-ENG16 5H836 LJ29		
Course title (and course title in English)	先端生物化学 Advanced Biological Chemistry	Instructor's name, job title, and department of affiliation	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 Associate Professor,HARA YUUJI Graduate School of Engineering Senior Lecturer,TAMURA TOMONORI

Target year		Number of credits	3	Year/semesters	2021/First semester
Days and periods	Mon.2,Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,
,4times,
,3times,
,4times,
,2times,
,2times,
,3times,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

Continue to 先端生物化学(2)↓↓↓

先端生物化学(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.

未更新

Course number	G-ENG16 5P836 LJ29		
Course title (and course title in English)	先端生物化学続論 Advanced Biological Chemistry 2 Continued	Instructor's name, job title, and department of affiliation	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 Associate Professor,HARA YUUJI Graduate School of Engineering Senior Lecturer,TAMURA TOMONORI

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,3times,
,2times,

[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.

未更新

Course number	G-ENG46 7S807 SJ60		
Course title (and course title in English)	合成・生物化学特別セミナー１ Special Seminar 1 in Synthetic Chemistry and Biological Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGOSHI TOMOKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

,,

[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.

未更新

Course number	G-ENG46 7S808 SJ60		
Course title (and course title in English)	合成・生物化学特別セミナー２ Special Seminar 2 in Synthetic Chemistry and Biological Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGOSHI TOMOKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG46 7S809 SJ60		
Course title (and course title in English)	合成・生物化学特別セミナー３ Special Seminar 3 in Synthetic Chemistry and Biological Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OGOSHI TOMOKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

Course number	G-ENG17 9E038 LJ76		
Course title (and course title in English)	プロセス設計 Process Design	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Concept of process design,1time,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.
Computer-aided process design,1time,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.
How to use process simulators,2times,How to use the process simulator which is widely used in the real process design is explained.
Reality of process design,6times,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.
Practice of a chemical process design, 1 times,The design exercise is executed by 2 to 3 students#039 group.
Oral presentation,4times,The design result at each group is presented at the oral session where all the faculty members attend.

[Course requirements]

The basic knowledge of chemical engineering such as the unit operation and reaction engineering are requested.

[Evaluation methods and policy]

The results are evaluated by the contents of the final report and the oral presentation.

Continue to プロセス設計(2)↓↓↓

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.

Course number	G-ENG17 8E041 PB76		
Course title (and course title in English)	研究インターンシップ（化工） Research Internship in Chemical Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

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。

[Course objectives]

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ニュ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。

[Course schedule and contents]

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。

[Course requirements]

None

[Evaluation methods and policy]

成果報告（英語による口頭発表および質疑）

[Textbooks]

Not fixed

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

渡航の準備は各自で行う。

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG17 7E045 EJ76		
Course title (and course title in English)	化学工学特別実験及演習Ⅰ Research in Chemical EngineeringI	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,10times,

[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.

未更新

Course number	G-ENG17 7E047 EJ76		
Course title (and course title in English)	化学工学特別実験及演習II Research in Chemical EngineeringII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,
,6times,
,10times,

[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.

未更新

Course number	G-ENG17 7E049 EJ76		
Course title (and course title in English)	化学工学特別実験及演習III Research in Chemical EngineeringIII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,6times,
,12times,

[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.

未更新

Course number	G-ENG17 7E051 EJ76		
Course title (and course title in English)	化学工学特別実験及演習IV Research in Chemical EngineeringIV	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,4times,
,12times,
,2times,

[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.

未更新

Course number	G-ENG17 5H002 LJ76		
Course title (and course title in English)	移動現象特論 Advanced Topics in Transport Phenomena	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YAMAMOTO RYOICHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

- Polymeric Liquids / Rheology 6 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 3 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 2 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 1

[Course requirements]

Under graduate level basic knowledge on “Fluid Mechanics / Transport Phenomena” and basic mathematics including “Vector Analyses” are required.

[Evaluation methods and policy]

Answers to several questions and exercises, which will be given during the course, are used to judge.

Continue to 移動現象特論 (2)↓↓↓

移動現象特論 (2)

[Textbooks]

Bird, Stewart 『Transport Phenomena 2nd Ed』 （Lightfoot, (Wiley)）

[References, etc.]

（Reference books）

Doi 『Introduction to Polymer Physics』 （Oxford）
Hansen, McDonald 『Theory of Simple Liquids 4th Ed』 （Academic Press）
Russel 『Colloidal Dispersions』 （Saville, and Schowlter, (Cambridge)）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

This is an biennial course which will be open in 2016, 2018, 2020, ...

*Please visit KULASIS to find out about office hours.

Course number	G-ENG17 5H005 LJ76						
Course title (and course title in English)	**分離操作特論** Separation Process Engineering, Adv.			Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SANO NORIAKI Graduate School of Engineering Associate Professor,NAKAGAWA KYUYA		
Target year		Number of credits	1.5	Year/semesters	2021/First semester		
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese		

[Overview and purpose of the course]

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.

[Course objectives]

This course will deepen the students#039 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.

[Course schedule and contents]

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.

Adsorption (3times): 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. When one wants to select appropriate adsorbents, features and properties of typical adsorbents should be known. These points will be lectured. Also, some methods to synthesize adsorbents from waste materials are explained.

Drying mechanism and preservation of product quality (2times): Drying is a typical operation utilizing phase transformation and simultaneous transport of heat and mass. A variety of drying units are explained, and the points to designing these units will be lectured. Many examples of troubles seen in drying operations will be explained.

Other separation operations (1time): Other separation operations, for example liquid-liquid extraction, membrane separation, etc. will be lectured.

[Course requirements]

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)

[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.

Course number	G-ENG17 5H009 LE76		
Course title (and course title in English)	Chemical Reaction Engineering, Adv. Chemical Reaction Engineering, Adv.(English lecture)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI Graduate School of Engineering Associate Professor,NAKAGAWA HIROYUKI Graduate School of Engineering Senior Lecturer,ASHIDA RIYUUICHI

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

This lecture is given in English. The following contents are covered: - Kinetic analysis of gas-solid-catalyst reaction, gas-solid reaction, and CVD reaction, - Operation and design of reactors for gas-solid-catalyst and gas-solid reactions, and - Industrial reactors including fixed bed, fluidized bed, moving bed, simulated moving bed, and stirred tank types.

[Course objectives]

To understand kinetic analysis of chemical reactions utilized in the industry and procedure to design and operate industrial reactors.

[Course schedule and contents]

Gas-solid-catalyst reaction (1) Fundamentals 1 Commercial catalysts and industrial gas-solid-catalyst reactions are overviewed. Chemical reaction engineering fundamentals of the gas-solid-catalyst reaction is explained.
Gas-solid-catalyst reaction (2) Generalized effectiveness factor and selectivity in complex reactions 1 The generalized effectiveness factor and the selectivity affected by mass transfer are explained.
Gas-solid-catalyst reaction (3) Deactivation and regeneration of catalyst 2 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.
Gas-solid-catalyst reaction (4) Design and operation of industrial catalytic reactors 1 Industrial catalytic reactors including fixed-bed and fluidized-bed reactors are overviewed. Design and operation of these reactors including thermal stability are explained.
Liquid-solid-catalyst reaction -- Simulated moving bed reactor 1 Concept and applications of simulated moving bed reactor are explained. Model-based analysis of simulated moving bed reactor is explained.
CVD reaction 2 Fundamentals of CVD reactions are explained from chemical reaction engineering view point. Kinetic analysis of CVD is described. Reaction models including elementary reaction model and overall reaction model are derived and applied to some examples.
Gas-solid reaction (1) Kinetic analysis 2 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).
Gas-solid reaction (2) Kinetic analysis of gas-solid reaction 1 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.

Continue to Chemical Reaction Engineering, Adv. (2)↓↓↓

Chemical Reaction Engineering, Adv. (2)

[Course requirements]

Needs knowledge of chemical reaction engineering including heterogeneous reactions.

[Evaluation methods and policy]

The score is based on the result of examination at the end of term and the results of quizzes and reports imposed every week. The full mark is 100 points.

[Textbooks]

Prints are hand out at the class.

[References, etc.]

（Reference books）

特になし

[Study outside of class (preparation and review)]

未記入

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG17 5H017 LJ76		
Course title (and course title in English)	微粒子工学特論 Fine Particle Technology, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUSAKA SHUJI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Various particle properties and different types of measurement methods (3 classes)
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.

Particle adhesion and mechanical (kinetic) analysis (3 classes)
Lectures cover measurement methods for particle adhesion strength and collision and deformation mechanical analysis methods. The discrete element method is also explained.

Particle behavior in air flow (3 classes)
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.

Particle charge and control (2 classes)
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.

[Course requirements]

Students should have fundamental knowledge of undergraduate-level particle engineering.

Continue to 微粒子工学特論(2)↓↓↓

微粒子工学特論(2)

[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.

Course number	G-ENG17 5H020 LJ76		
Course title (and course title in English)	界面制御工学 Surface Control Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MIYAHARA MINORU

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Surface / interface features (1 session)
Surface / interface instability implied by surface tension, overview of lecture

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.

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.

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.

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.

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.

未更新

Course number	G-ENG17 5H021 LJ76		
Course title (and course title in English)	化学材料プロセス工学 Engineering for Chemical Materials Processing	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOSHIMA MASAHIRO Graduate School of Engineering Associate Professor,NAGAMINE SHINSUKE Graduate School of Engineering Assistant Professor,HIKIMA YUUTA

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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,1time,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.

未更新

Course number	G-ENG17 5H023 LJ76		
Course title (and course title in English)	環境システム工学 Environmental System Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MAE KAZUHIRO Graduate School of Engineering Associate Professor,MAKI TAISUKE

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Concept of environmentally benign system based on exergy,4times,Basic of exergy and calculation of exergy for various conversion process. The exercise will be conducted to confirm the understanding of exergy.

Biomass conversion,3times,Introduction of various conversion processes for baiomass and wastes from the view point of kinetics.

Environmental evaluation method (1),2times,Introduction of various environmental evaluation methods Calculation of LCA analysis

Environmental evaluation method (2),2times,Calculation of E-factor and environmental efficiency for sevaral chemical processes

Confirmation of study achievement,1time,Feedback of evaluation results for reports and exercises.

[Course requirements]

Basic knowledge for chemical engieering themodynamics is required.

[Evaluation methods and policy]

Coursework will be graded based on the reports and the exercise in class.

Continue to 環境システム工学(2)↓↓↓

環境システム工学(2)

[Textbooks]

The textbook is not required. Materials will be supplied by instructors.

[References, etc.]

（Reference books）

Pysical chemistry, Themodynamics

[Study outside of class (preparation and review)]

Prepareation study is reqired to understand the exergy.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG17 6H030 LJ76				
Course title (and course title in English)	化学工学特論第一 Special Topics in Chemical Engineering I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,NAKAGAWA HIROYUKI		
Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Efficient use of fossil fuels and utilization of renewable energy is said to be one of the most important agendas from the viewpoint of depletion of fossil fuels and global warming. This course will cover the fundamental concepts of energy, especially power generation, and recent developments of the technique for hydrogen utilization.

[Course objectives]

・ Evaluating the energy balance and efficiency for power generation and heat utilization processes
・Understanding the feature of renewable energy resources and current developments of their utilization processes

[Course schedule and contents]

1. Worldwide energy supply and demand (energy consumption in Japan and the world)
2. Energy from fossil fuel sources
3. Renewable energy sources I (biomass)
4. Renewable energy sources II (solar, wind, coastal)
5. Energy utilization (waste heat energy, heat integration)
6. Energy efficiency enhancement (Cogeneration, Kalina cycle)
7. Mass utilization (Mass integration)
8. Assessment of chemical releases into the environment (impact on humans, ecosystem, sources)
9. Sustainable chemical processes and Green chemistry
10. Inherently safe processes
11. Life cycle impact assessment

[Course requirements]

Basic process design, mathematics

[Evaluation methods and policy]

Evaluation will be based on assignments (8 times, 5 points each), and examinations (twice, 30 points each).

Continue to 化学工学特論第一(2)↓↓↓

化学工学特論第一(2)

[Textbooks]

Instructed during class
Any necessary textbook or material will be announced in class.

[References, etc.]

（Reference books）

Nothing special

[Study outside of class (preparation and review)]

Undecided

（Other information (office hours, etc.)）

Please check the office hours in KULASIS. However, another time possible upon reservation in advance.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG17 6H035 LJ76		
Course title (and course title in English)	化学工学特論第四 Special Topics in Chemical Engineering IV	Instructor's name, job title, and department of affiliation	Part-time Lecturer,HIRANO SHIGEKI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 化学工学特論第四(2)↓↓↓

化学工学特論第四(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	G-ENG17 5H053 LJ76		
Course title (and course title in English)	プロセスデータ解析学 Process Data Analysis	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

This class outlines the methodologies of exploiting operation data for predicting product qualities, and for improving process performance. The topics include basics of statstics and probability theory, correlation analysis, regression analysis, and mutivariate analysis.

[Course objectives]

Students will acquire skills to analyse data, which would help building softsensors, and statistical process control systems.

[Course schedule and contents]

1. Introduction
2. Statistics and probability theory
3. Linear algebra
4. Regression analysis (I)
5. Regression analysis (II)
6. Exercise
7. Principal component analysis
8. PLS (Partial least squares)
9. Discriminant analysis
10. Softsensor (I)
11. Softsensor (II)

[Course requirements]

None

[Evaluation methods and policy]

Evaluation is based on the assignment and final exam.

[Textbooks]

永田，棟近 『多変量解析法入門』（サイエンス社）

[References, etc.]

（Reference books）

None

Continue to プロセスデータ解析学(2)↓↓↓

プロセスデータ解析学(2)

[Study outside of class (preparation and review)]

None

（Other information (office hours, etc.)）

This lecture is held every two years.

*Please visit KULASIS to find out about office hours.

Course number	G-ENG52 5H420 LE61		
Course title (and course title in English)	集積化学プロセス Integrated Chemical Processes	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO Graduate School of Engineering Associate Professor,MAKI TAISUKE Graduate School of Engineering Assistant Professor,MURANAKA YOSUKE Graduate School of Engineering Assistant Professor,TONOMURA OSAMU

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

The basic concept of unit operation using micro space is explained. Then, the design and control strategies of new micro chemical plants are lectured.

[Course objectives]

A deeper understanding of the following points is the target of this course: 1)Understand the method of quantitative treatment of transport phenomena and mixing in micro space, 2)Based on the fundamental knowledge of micro chemical engineering explained above, acquire the skill of designing various types of micro reactors and micro mixers, 3)Understand the difference of micro chemical processes and conventional chemical processes, and acquire the skills of designing the operation and control systems.

[Course schedule and contents]

Waht is microreactor? 1 Preliminary exercises (for understanding students' knowledge level of chemical engineerinh). Explain merits and utilization concepts of microreactor with illustrating typical microreactor structure.
Trasport phenomena in micro space 2 Introduce how to treat quantitatively the transport phenomena in micro channel. Especially, explain the basic and modelling for heat transfer in micro channel. Finally, master the concept and design of micro heat exchanger.
Micro mixing 1 Starting from the logic of micro mixing, explain the design and operation factors of micr omixer with illustrating various micro mixers. Next, introduce the concept of micro mixing of immiscible fluids (liwuid/liquid and gas/liquid) for strict control of emulsion and bubble.
Micro reaction engineering 3 Introduce microreactors for organic synthesis, nano-particle production device, catalytic microreactor, and segmented flow microreactor with illustrating their drastic effect for quality control of products. Next, explain the methodology of design each reactor and its application.
Design of micro chemical process 2 The design method considering the feature of micro chemical plant is explained. Especially, the treatment as a system and the numbering-up methods are discussed.
Operation and control of micro chemical processes 2 The difference between the control scheme of the conventional plants and that of the micro plants is explained. Then, the operation and control methods of numbering-up process and the fault detection method of blocked device are explained.

Continue to 集積化学プロセス(2)↓↓↓

集積化学プロセス(2)

[Course requirements]

Basic knowledge for calculus, transport phenomena, chemical reaction enguneering, process control are required, but we consider to be able to understand for the students with no prior knowledge by introducing reference books.

[Evaluation methods and policy]

Coursework will be graded based on reports, quiz in lecture, and examination.

[Textbooks]

The textbook is not required. Materials will be supplied by instructors.

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Knowledge of chemical engineering in undergraduate level is required.

（Other information (office hours, etc.)）

The class is opened in 2019, and opened every other year.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG17 6P043 LJ76

Course title (and course title in English)	化学工学セミナー１ Chemical Engineering Seminar I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,

[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.

未更新

Course number	G-ENG17 6P044 LJ76		
Course title (and course title in English)	化学工学セミナー２ Chemical Engineering Seminar II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,

[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.

未更新

Course number	G-ENG17 6P045 LJ76		
Course title (and course title in English)	化学工学セミナー３ Chemical Engineering Seminar III	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,

[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.

未更新

Course number	G-ENG17 6P046 LJ76		
Course title (and course title in English)	化学工学セミナー４ Chemical Engineering Seminar IV	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,

[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.

未更新

Course number	G-ENG47 6T004 LJ76		
Course title (and course title in English)	化学工学特別セミナー１ Special Seminar in Chemical Engineering 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,2times,
,1time,
,2times,
,1time,
,2times,
,1time,

[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.

Course number	G-ENG47 6T005 LJ76		
Course title (and course title in English)	化学工学特別セミナー２ Special Seminar in Chemical Engineering 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

Process intensification has become an important research field in chemical engineering. It is about devising a non-classical apparatuses or operation methods, which attain a substantial improvement in the process performance. Microreactor is a typical device which achieves intensification of reaction process. Periodic operation of chemical apparatuses, and process with highly integrated heat and mass exchange system are viewed as results of the process intensification. In this class, several different approaches to process intensification, with successful examples, will be introduced in this class.

[Course objectives]

Students will understand the typical approaches and examples of process intensification.

[Course schedule and contents]

1 Introduction to process intensification
2 High gravity field for distillation (1)
3 High gravity field for distillation (2)
4 Spinning disk reactor (1)
5 Spinning disk reactor (2)
6 High intensity mixers and microreactors (1)
7 High intensity mixers and microreactors (2)
8 Hybrid separation (1)
9 Hybrid separation (2)
10 Unsteady state operation of reactor (1)
11 Unsteady state operation of reactor (2)
12 Multifunctional reactors (1)
13 Multifunctional reactors (2)
14 Industrial applications (1)
15 Industrial applications (2)

[Course requirements]

None

Continue to 化学工学特別セミナー２(2)↓↓↓

化学工学特別セミナー２(2)

[Evaluation methods and policy]

Report: 40x2 points
Attendance: 10 points
Contributions to the course: 10 point

[Textbooks]

Not fixed

[References, etc.]

（Reference books）

A. Stankiewicz et al 『Re-engineering of the chemical processing plant』（Marcel Dekker）ISBN:978-0824743024

[Study outside of class (preparation and review)]

Need to read corresponding parts of the textbook in advance to each course.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG47 6T006 LJ76		
Course title (and course title in English)	化学工学特別セミナー３ Special Seminar in Chemical Engineering 3	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,2times,
,2times,
,2times,
,2times,
,2times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG47 6T009 LJ76

Course title (and course title in English)	化学工学特別セミナー６ Special Seminar in Chemical Engineering 6	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO Graduate School of Engineering Professor,YAMAMOTO RYOICHI Graduate School of Engineering Professor,KAWASE MOTOAKI Graduate School of Engineering Professor,MATSUSAKA SHUJI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Through the lectures on the advances and latest problems in the chemical engineering, future directions of technology are discussed.

[Course objectives]

[Course schedule and contents]

Deep understanding of the fundamental and/or latest contents of a field of chemical engineering.

[Course requirements]

Required master degree knowledge on chemical engineering

[Evaluation methods and policy]

The contribution to the discussion and the contents of the homework of each subject are used for evaluation.

[Textbooks]

Printed materials of related contents are offered.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

This class is opened in 2019 and every other year.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG47 6T010 LJ76		
Course title (and course title in English)	化学工学特別セミナー７ Special Seminar in Chemical Engineering 7	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MAE KAZUHIRO Graduate School of Engineering Associate Professor,MAKI TAISUKE

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Some topics in the state-of-the-art studies related to chemical engineering are lectured. In the first half, extension of chemical engineering to electrochemical reaction processes is explained with taking a polymer electrolyte fuel cell as an example. In the latter half, application of chemical engineering to reactions of complex heavy carbonaceous resources is presented and kinetic modeling of reactions of solids and heavy liquids for predicting the rate and quality of the products is explained.

[Course objectives]

[Course schedule and contents]

Chemical reaction engineering of fuel cells 5 Extension of chemical engineering to electrochemical reaction processes is explained with taking a polymer electrolyte fuel cell as an example.
Case studies of polymer electrolyte fuel cell 4 Based on the proposed theory, some case studies are discussed in which the effects of convective flow as well as the effects of catalyst layer structure including the catalyst layer thickness, pore structure parameters, and catalyst activity on the cell performance are estimated.
Chemical reaction engineering of conversion of heavy carbonaceous resources 6 Approach to conversion processes of heavy carbonaceous resources including low-rank coal and biomass from the view point of chemical reaction engineering is explained.

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 化学工学特別セミナー７(2)↓↓↓

化学工学特別セミナー７(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

This is an biennial course which will be open in 2017, 2019, ...

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG50 6G047 LJ71

Course title (and course title in English)	応用力学 Applied Dynamics	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,2times,
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,2times,
,2times,
,2times,
,2times,
,1time,

[Course requirements]

None

Continue to 応用力学(2)↓↓↓

応用力学(2)

[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.

未更新

Course number	G-ENG50 6V037 EB71				
Course title (and course title in English)	応用力学特別実験及び演習第一 Advanced Experiment and Exercise in Applied Mechanics I		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI	
Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,5times,

[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.

未更新

Course number	G-ENG50 6V037 EB71		
Course title (and course title in English)	応用力学特別実験及び演習第二 Advanced Experiment and Exercise in Applied Mechanics II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,5times,

[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.

未更新

Course number	G-ENG70 7W005 SJ71		
Course title (and course title in English)	応用力学特別演習Ａ Advanced Exercise in Applied Mechanics A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
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,2times,
,2times,
,2times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG70 7W007 SJ71

Course title (and course title in English)	応用力学特別演習Ｂ Advanced Exercise in Applied Mechanics B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester

Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
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,2times,
,2times,
,2times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG70 7W009 SJ71		
Course title (and course title in English)	応用力学特別演習C Advanced Exercise in Applied Mechanics C	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
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,2times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG70 7W011 SJ71		
Course title (and course title in English)	応用力学特別演習Ｄ Advanced Exercise in Applied Mechanics D	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
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,2times,
,1time,

[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.

未更新

Course number	G-ENG70 7W013 SJ71		
Course title (and course title in English)	応用力学特別演習 E Advanced Exercise in Applied Mechanics E	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
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,2times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG70 7W015 SJ71				
Course title (and course title in English)	**応用力学特別演習 F** Advanced Exercise in Applied Mechanics F		**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,HOUJIYOU MASAKI	
Target year		**Number of credits**	2	**Year/semesters**	2021/Intensive, Second semester
Days and periods	Intensive	**Class style**	Seminar	**Language of instruction**	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,2times,
,2times,
,2times,
,2times,
,2times,
,2times,
,1time,

[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.

未更新

Course number	G-ENG70 6W017 EJ73		
Course title (and course title in English)	構造工学実験法 Strucutual Testing Technology	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,YAGI TOMOMI

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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

Continue to 構造工学実験法(2)↓↓↓

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.

Course number	G-ENG50 6W019 PJ71		
Course title (and course title in English)	インターンシップM（応用力学） Engineering Internship M	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,KUROSE RYOUICHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

On-site learning of the importance of teamwork and production processes in manufacturing is also the aim.

[Course objectives]

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.

[Course schedule and contents]

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.
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).

[Course requirements]

None

[Evaluation methods and policy]

Credits (2) are approved based on the summary report (50%) and presentation (50%) about the internship activities.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[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.

Course number	G-ENG70 6W021 PJ71		
Course title (and course title in English)	インターンシップDS（応用力学） Engineering Internship DS	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,KUROSE RYOUICHI

Target year		Number of credits	4	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Credits (4) are approved based on the summary report (50%) and presentation (50%) about the internship activities.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[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.

Course number	G-ENG70 6W023 PJ71		
Course title (and course title in English)	インターンシップDL（応用力学） Engineering Internship DL	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,KUROSE RYOUICHI

Target year		Number of credits	6	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Credits (6) are approved based on the summary report (50%) and presentation (50%) about the internship activities.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[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.

未更新

Course number	G-ENG70 6W025 SB71		
Course title (and course title in English)	応用力学セミナーA Seminar on Applied Mechanics A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,5times,

[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.

未更新

Course number	G-ENG70 6W027 SB71		
Course title (and course title in English)	応用力学セミナーB Seminar on Applied Mechanics B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOUJIYOU MASAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,5times,
,5times,

[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.

未更新

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 Graduate School of Engineering Associate Professor,ITOU AKIHIRO Institute for Chemical Research Professor,NAKAMURA MASAHARU Graduate School of Engineering Professor,NAKAO YOSHIAKI Graduate School of Engineering Associate Professor,HIGASHI MASAHIRO

Target year		Number of credits	1.5	Year/semesters	2021/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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 design for efficient and sustainable catalysis, 2 times.
This lecture describes several important ideas for development of highly efficient organotransition metal catalysts in green and sustainable chemistry. Highly efficient coupling reactions for carbon-carbon bond formation employing 3d transition metal, especially iron, catalysts are included (Nakamura).

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)

Theoretical analysis of molecular function and composite-assembly function, 2 times.
This lecture describes the basis of quantum chemical method and molecular dynamics simulation for theoretical analysis of molecular function and composite-assembly function. The recent applications of these methods are also demonstrated (Higashi).

Photovoltaic conversion based on molecular assembly of organic semiconductors, 2 times.
This lecture gives an introduction to polymer solar cells. It starts by introducing various conjugated polymers as semiconductor, which are promising materials for organic optoelectronics such as organic light-emitting diode displays and organic photovoltaic cells. The fundamental mechanism of organic solar cells is then briefly explained to clarify how self-assembling structures of semiconducting materials impact on the photovoltaic performance. Recent progress in this field is overviewed and several challenging studies are also introduced (Ohkita).

Theoretical design for functional molecules from the view of electron-vibration interactions, 2 times.
This lecture describes theoretical design principles for highly efficient emitting and carrier-transporting molecules in organic light-emitting diodes (OLED) from the view of electron-vibration interactions (vibronic couplings) (Sato).

Molecular design and device function of organic light-emitting diodes, 2 times.
This lecture focuses on recently-developed organic light-emitting diodes (OLEDs). The contents are: 1) the history, 2) basic concept, 3) molecular design to realize excellent light-emitting performance, 4) charge transport simulation, and 5) device fabrication (Kaji).

[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)

[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.

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)

（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.

未更新

Course number	G-ENG52 5H407 LJ61		
Course title (and course title in English)	複合系の物理化学と解析技術 Physical Chemistry and Analytical Techniques of Complex Systems	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,TANAKA KATSUHISA Graduate School of Engineering Professor,SAKKA TETSUO Institute for Integrated Radiation and Nuclear Science Professor,OTSUKI TSUTOMU Graduate School of Engineering Professor,TANAKA TSUNEHIRO Institute for Chemical Research Professor,WATANABE HIROSHI Graduate School of Engineering Professor,KOGA TSUYOSHI Graduate School of Engineering Professor,NAKAMURA YOU Graduate School of Engineering Professor,YAMAMOTO RYOICHI Graduate School of Engineering Professor,MIYAHARA MINORU

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Mon.5	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

This course focuses on fundamentals of physical chemistry for a quantitative understanding of structure, reaction, and properties of matters in complex systems. Analytical techniques including theoretical, numerical, and experimental approaches for clarification of the phenomena in complex systems are also introduced.

[Course objectives]

[Course schedule and contents]

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

Continue to 複合系の物理化学と解析技術 (2)↓↓↓

複合系の物理化学と解析技術 (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.

未更新

Course number	G-ENG52 5H409 LE61		
Course title (and course title in English)	化学から生物へ生物から化学へ Frontiers in the Field of Chemical Biology and Biological Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AKIYOSHI KAZUNARI Graduate School of Engineering Professor,SHIRAKAWA MASAHIRO Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO Graduate School of Engineering Professor,HAMACHI ITARU Graduate School of Engineering Professor,MORI YASUO Graduate School of Engineering Professor,ATOMI HARUYUKI Graduate School of Engineering Professor,NUMATA KEIJI

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Tue.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

In the cutting-edge of reseach fields, chemistry and biologi are being closely related each other. In this class, progress in such interdisciplinary areas and topics including natural products, biophysics, bioimaging , baimaterials, regenerative medicine, microbiology, thermal biology, strucural biology, chemical biology, molecular physiology and others, are briefly explained and discussed.

[Course objectives]

Students will be able to understand recent progress and trends in broad interdisciplinary areas between biology and chemistry and make their own ideas in these research fields from a viewpoint of indicvidual researchers and engineers.

[Course schedule and contents]

10/6-1/12 11 The guidance will be conducted at the first day of this class (Oct. 6th, 2015).

[Course requirements]

Fundamentals in chemistry, biochemistry, biology, and materials science.

[Evaluation methods and policy]

Evaluation will be conducted by attendance and scores for excercises and problems that each lecturer charges in his topics

Continue to 化学から生物へ生物から化学へ(2)↓↓↓

化学から生物へ生物から化学へ(2)

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

The credit for MS2 students will be guided in detail at the first day.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG52 6H446 SE61		
Course title (and course title in English)	English for Debate and Communications English for Debate and Communications	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OOSHIMA MASAHIRO

Target year		Number of credits	1.5	Year/semesters	2021/Second semester
Days and periods	Fri.3,4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

Unit 1: Giving Your Opinion,2times,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,2times,Discussion Focus/ Key points Topic Sentence, Primary Sentence, Debatable/No-debatable Practice Primary Supporting Sentence Practice Connecting Words amp Practice Discussion and Simulation. Debate Question of the Week 2
Unit 3: Organizing Your Opinion,2times,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,2times,Discussion Focus/ Key points Interrupting, Interrupting Practice Refuting Opinions, Refutation Practice Discussion and Simulations. Debate Question of the Week 4
Unit 5:Challenging Support,2times,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,2times,Discussion Focus/ Key points Persuasive Language Delivery Focus: Word/Sentence Stress. Intonation Discussion and Simulations. Debate Question of the Week 6

[Course requirements]

None

[Evaluation methods and policy]

Attendance and performance in the class

[Textbooks]

a in-house booklet be provided

Continue to English for Debate and Communications(2)↓↓↓

English for Debate and Communications(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.

未更新

Course number	G-ENG52 6H470 PE61				
Course title (and course title in English)	JGP国際インターンシップ Ⅰ（短期） JGP International Internship I		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI	
Target year		Number of credits	1	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

International Internship,20times,At the overseas cooperation university in Kyoto University Top Global Program, a research-based internship of one month is executed.
Seminar,1time,The contents of the internship is reported at the seminar.

[Course requirements]

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.

[Evaluation methods and policy]

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.

[Textbooks]

None

[References, etc.]

（Reference books）

None

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

By the limitation of budget for each year, the number of students will be restricted.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG52 6H471 PE61

Course title (and course title in English)	JGP国際インターンシップ II（中期） JGP International Internship II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

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.

[Evaluation methods and policy]

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.

[Textbooks]

None

[References, etc.]

（Reference books）
None

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

By the limitation of budget for each year, the number of students will be restricted.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG52 6H472 PE61				
Course title (and course title in English)	JGP国際インターンシップ III（長期） JGP International Internship III		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI	
Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

This course aims to acquire the skills of communicating with foreign researchers, managing the research, and writing academic papers.

[Course schedule and contents]

Theme Class number of times Description International internship,60times,At the overseas cooperation university in Kyoto University Top Global Program, a research-based internship of more than three month is executed.
Seminar,1time,The contents of the internship is reported at the seminar.

[Course requirements]

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.

[Evaluation methods and policy]

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.

[Textbooks]

None

[References, etc.]

（Reference books）

None

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

By the limitation of budget for each year, the number of students will be restricted.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG14 6P448 LE60		
Course title (and course title in English)	JGPセミナーⅠ Japan Gateway Project Seminar I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P450 LE60		
Course title (and course title in English)	JGPセミナーII Japan Gateway Project Seminar II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P452 LE60

Course title (and course title in English)	JGPセミナーIII Japan Gateway Project Seminar III	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P454 LE60		
Course title (and course title in English)	JGPセミナーIV Japan Gateway Project Seminar IV	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P456 LE60		
Course title (and course title in English)	JGPセミナーV Japan Gateway Project Seminar V	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P457 LE60		
Course title (and course title in English)	JGPセミナーVI Japan Gateway Project Seminar VI	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P459 LE60		
Course title (and course title in English)	JGPセミナーⅦ Japan Gateway Project Seminar VII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P461 LE60

Course title (and course title in English)	JGPセミナーⅧ Japan Gateway Project Seminar VIII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P463 LE60		
Course title (and course title in English)	JGPセミナーIX Japan Gateway Project Seminar IX	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P465 LE60		
Course title (and course title in English)	JGPセミナーX Japan Gateway Project Seminar X	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P467 LE60

Course title (and course title in English)	JGPセミナーXI Japan Gateway Project Seminar XI	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

未更新

Course number	G-ENG14 6P469 LE60

Course title (and course title in English)	JGPセミナーＸII Japan Gateway Project Seminar XII	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASE MOTOAKI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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.

[Course requirements]

The basic knowledge for understanding the specific theme and the ability of understanding the lecture in English are requested.

[Evaluation methods and policy]

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.

[Textbooks]

A copy of related contents is offered.

[References, etc.]

（Reference books）

Announced in the lecture.

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Professors of the faculty of engineering who are doing similar research support a student#039s 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.

Course number	G-ENG14 6P470 LE60		
Course title (and course title in English)	JGP計算実習(CFD) Japan Gateway Project Computation Exercise(CFD)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SOTOWA KENICHIRO Graduate School of Engineering Assistant Professor,TONOMURA OSAMU

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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)

[Course requirements]

It is desirable to have basic knowledge on modeling related to material balance.

[Evaluation methods and policy]

Evaluation is based on the task in the lecture and the report.

Continue to JGP計算実習(CFD)(2)↓↓↓

JGP計算実習(CFD)(2)

[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.

未更新

Course number	G-ENG14 6P471 LE60		
Course title (and course title in English)	JGP計算実習(MO) Japan Gateway Project Computation Exercise(MO)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SATO HIROFUMI Center for the Promotion of Interdisciplinary Education and Research Program-Specific Associate Professor,FUKUDA　RYOICHI

Target year		Number of credits	0.5	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,1time,
,1time,

[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.

未更新

Course number	G-ENG52 6W432 EB61		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG52 6W433 EB61		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG52 6W434 EB61				
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI		
Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG52 6W435 EB61		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG72 6W437 SB61		
Course title (and course title in English)	物質機能・変換科学特別セミナーＩ Advanced Seminar on Materials Engineering and Chemistry I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,8times,

[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.

未更新

Course number	G-ENG72 6W438 SB61						
Course title (and course title in English)	物質機能・変換科学特別セミナーII Advanced Seminar on Materials Engineering and Chemistry II			Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI		
Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester		
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,8times,

[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.

未更新

Course number	G-ENG72 6W439 SB61		
Course title (and course title in English)	物質機能・変換科学特別セミナーIII Advanced Seminar on Materials Engineering and Chemistry III	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,8times,

[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.

未更新

Course number	G-ENG72 6W440 SB61				
Course title (and course title in English)	物質機能・変換科学特別セミナーIV Advanced Seminar on Materials Engineering and Chemistry IV	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI		
Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,8times,

[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.

未更新

Course number	G-ENG72 6W441 SB61		
Course title (and course title in English)	物質機能・変換科学特別セミナーV Advanced Seminar on Materials Engineering and Chemistry V	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,8times,

[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.

未更新

Course number	G-ENG72 6W442 SB61				
Course title (and course title in English)	物質機能・変換科学特別セミナーVI Advanced Seminar on Materials Engineering and Chemistry VI		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAGEYAMA HIROSHI	
Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,8times,

[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.

未更新

Course number	G-ENG53 3W606 LJ88		
Course title (and course title in English)	画像診断学 Diagnostic Imaging	Instructor's name, job title, and department of affiliation	Graduate School of Medicine Professor,NAKAMOTO YUUJI

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,6times,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

Course number	G-ENG53 6W618 PJ89　G-ENG53 5M424 SJ25　G-ENG53 5M424 SJ88 G-ENG53 5M424 SJ89

Course title (and course title in English)	放射線治療計画・計測学実習 Radiation Treatment Planning, Radiation Treatment Metrology, Practice	Instructor's name, job title, and department of affiliation	Graduate School of Medicine Associate Professor,NAKAMURA MITSUHIRO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

がんの放射線治療について、治療全体の流れや治療方法の概要、実際の放射線治療前に実施される治療計画の流れを講義する。治療計画を作成する治療計画装置、治療計画に用いる医用画像の種類や特徴、患者セットアップ誤差や治療時に想定される照射誤差を治療計画に反映させる方法とその基本概念について学修する。さらに、実際の治療現場にて患者セットアップから治療計画を経て治療を実施するまでの過程の見学や、治療計画装置を用いた治療計画作成実習を行い理解を深める。また、放射線治療の基本となる線量測定について、放射線計測機器や臨床における線量検証の重要性について講義するとともに、実際の治療装置を用いて治療計画検証の線量測定の実習を行う。

[Course objectives]

がんに対する放射線治療について，放射線治療全体の流れや放射線治療法の概要，放射線治療前の工程を説明でき，放射線治療関連機器を正しく使用できる．
CTシミュレーション，放射線治療計画，品質管理/品質保証，患者位置照合を独力で実施できる．

[Course schedule and contents]

集中講義（3日間）で下記講義内容を実施予定。
（１）放射線治療概論【１回】
（２）放射線治療計画概論【２回】
（３）放射線計測理論【２回】
（４）治療計画装置・計算アルゴリズム【２回】
（５）治療計画実習【４回】
（６）線量測定実習【４回】

[Course requirements]

None

[Evaluation methods and policy]

詳細は別途通知する。

Continue to 放射線治療計画・計測学実習(2)↓↓↓

放射線治療計画・計測学実習(2)

[Textbooks]

特になし

[References, etc.]

（Reference books）

特になし

[Study outside of class (preparation and review)]

他大学・学術団体・職能団体が開催している勉強会を活用する．勉強会の情報は教員から提供する．

（Other information (office hours, etc.)）

詳細は別途通知する。
白衣を持参すること。

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG53 2B05a LJ87　G-ENG53 2W641 LB87		
Course title (and course title in English)	生理学 Physiology	Instructor's name, job title, and department of affiliation	Graduate School of Medicine Professor,WATANABE DAI

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,3times,
,2times,
,2times,
,2times,
,4times,
,1time,
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[Course requirements]

None

[Evaluation methods and policy]

Continue to 生理学(2)↓↓↓

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.

未更新

Course number	G-ENG53 5W670 LJ25		
Course title (and course title in English)	生命医工分野セミナーA(修士) Seminar on Bio-Medical Engineering A (MC)	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG53 5W671 LJ87		
Course title (and course title in English)	生命医工分野セミナーB(修士) Seminar on Bio-Medical Engineering B (MC)	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG53 6W681 EB25		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG53 6W683 EB25		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG53 5W685 LJ25		
Course title (and course title in English)	生命・医工分野特別セミナーA Seminar on Bio-Medical Engineering A	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG73 6W687 LJ87		
Course title (and course title in English)	生命・医工分野特別セミナーB Seminar on Bio-Medical Engineering B	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG73 6W689 LJ88		
Course title (and course title in English)	生命・医工分野特別セミナーC Seminar on Bio-Medical Engineering C	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG73 6W690 LJ89

Course title (and course title in English)	生命・医工分野特別セミナーD Seminar on Bio-Medical Engineering D	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG53 5W691 PJ25

Course title (and course title in English)	インターンシップM（生命・医工） Bio-Medical Engineering Internship M	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG73 5W692 PJ87		
Course title (and course title in English)	インターンシップD（生命・医工） Bio-Medical Engineering Internship D	Instructor's name, job title, and department of affiliation	Institute for Frontier Life and Medical Sciences Professor,TABATA YASUHIKO

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,,

[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.

未更新

Course number	G-ENG10 5X001 LJ72　G-ENG11 5X001 LJ72		
Course title (and course title in English)	融合光・電子科学の展望 Prospects of Interdisciplinary Photonics and Electronics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering Professor,KOBAYASHI TETSUO 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 Engineering Professor,YAMADA HIROFUMI Graduate School of Informatics Professor,Oki Eiji Graduate School of Science Professor,TANAKA KOUICHIROU Graduate School of Science Professor,YAMAMOTO JUN Institute for Chemical Research Associate Professor,HIRORI HIDEKI Part-time Lecturer,OHSIMA TAKESHI

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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[Course requirements]

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)

[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.

未更新

Course number	G-ENG54 6X003 EB72		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG54 6X005 EB72		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG74 6X007 LJ72

Course title (and course title in English)	融合光・電子科学特別セミナー Advanced Seminar on Interdisciplinary Photonics and Electronics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG54 6X009 SE72				
Course title (and course title in English)	融合光・電子科学通論 Recent Advances in Interdisciplinary Photonics and Electronics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU		
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Tue.5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,6times,
,9times,

[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.

未更新

Course number	G-ENG54 6X015 PJ72		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3,4,Fri.3,4	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,6times,

[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.

未更新

Course number	G-ENG54 6X017 PJ72				
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN		
Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3,4,Fri.3,4	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,6times,

[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.

未更新

Course number	G-ENG54 6X019 PJ72		
Course title (and course title in English)	研究インターンシップM(融合光) Research Internship (M)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese and English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG74 6X019 PJ72						
Course title (and course title in English)	研究インターンシップD(融合光) Research Internship (D)			**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN		
Target year		**Number of credits**	2	**Year/semesters**	2021/Intensive, year-round		
Days and periods	Intensive	**Class style**	Practical training	**Language of instruction**	Japanese and English		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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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.

未更新

Course number	G-ENG74 6X023 SJ72		
Course title (and course title in English)	融合光・電子科学特別演習1 Advanced Exercises on Interdisciplinary Photonics and Electronics I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG74 6X025 SJ72		
Course title (and course title in English)	融合光・電子科学特別演習2 Advanced Exercises on Interdisciplinary Photonics and Electronics II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,AMEMIYA NAOYUKI Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

Course number	G-ENG55 5X301 LE73		
Course title (and course title in English)	人間安全保障工学概論 Human Security Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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

[Course schedule and contents]

Orientation(1time)
Orientation, Self-Introduction and Photo Session

Overview of Human Security Engineering(1time)
What is Human Security Engineering? We will give brief answer to this question.

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.

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.

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.

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.

Technical tour(2times)
Technical tour on human security engineering.

Continue to 人間安全保障工学概論(2)↓↓↓

人間安全保障工学概論(2)

[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.

Course number	G-ENG75 7X305 LB24		
Course title (and course title in English)	都市ガバナンス学各論１ Lectures in Urban Governance 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Acquire practical approaches to problems concerning urban governance within human security engineering

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Participations, discussions and report

[Textbooks]

Not used

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.

Course number	G-ENG03 7X307 SB24		
Course title (and course title in English)	都市ガバナンス学各論２ Lectures in Urban Governance 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Acquire practical approaches to problems concerning urban governance

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Participations, discussions, and report

[Textbooks]

Not used

[References, etc.]

（Reference books）
Introduced during class

Continue to 都市ガバナンス学各論２(2)↓↓↓

都市ガバナンス学各論２(2)

[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.

Course number	G-ENG75 7X315 SE73		
Course title (and course title in English)	都市基盤マネジメント学各論1 Lectures in Urban Infrastructure Management 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

Custom-made Lecture
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.

[Course objectives]

Acquire practical approaches to problems concerning urban infrastructure management related to human security engineering.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Participations, discussions, and report

Continue to 都市基盤マネジメント学各論1(2)↓↓↓

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.

Course number	G-ENG75 7X317 SE73		
Course title (and course title in English)	都市基盤マネジメント学各論2 Lectures in Urban Infrastructure Management 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

Custom-made Lecture
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.

[Course objectives]

Acquire practical approaches to problems concerning urban infrastructure management related to human security engineering.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Participations, discussions and report

Continue to 都市基盤マネジメント学各論2(2)↓↓↓

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.

Course number	G-ENG75 7X323 SE24		
Course title (and course title in English)	健康リスク管理学各論1 Lectures in Health Risk Management 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

Custom-made Lecture
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.

[Course objectives]

Acquire practical approaches to problems concerning health risk management related to human security engineering.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Participations, discussions and report

Continue to 健康リスク管理学各論1(2)↓↓↓

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.

Course number	G-ENG75 7X325 SE24		
Course title (and course title in English)	健康リスク管理学各論2 Lectures in Health Risk Management 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

Custom-made Lecture
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.

[Course objectives]

Acquire practical approaches to problems concerning health risk management related to human security engineering.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Participations, discussions and report

Continue to 健康リスク管理学各論2(2)↓↓↓

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.

Course number	G-ENG75 7X335 SE24				
Course title (and course title in English)	災害リスク管理学各論1 Lectures in Disaster Risk Management 1		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA	
Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

Custom-made Lecture
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

[Course objectives]

Acquire practical approaches to problems concerning disaster risk management related to human security engineering.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Participations, discussions and report

[Textbooks]

Not used

[References, etc.]

（Reference books）
Introduced during class

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)

[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.

Course number	G-ENG75 7X337 SE24		
Course title (and course title in English)	災害リスク管理学各論2 Lectures in Disaster Risk Management 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

Custom-made Lecture
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.

[Course objectives]

Acquire practical approaches to problems concerning disaster risk management related to human security engineering.

[Course schedule and contents]

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.

[Course requirements]

None

[Evaluation methods and policy]

Participations, discussions and report

Continue to 災害リスク管理学各論2(2)↓↓↓

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.

Course number	G-ENG55 7X339 PE73				
Course title (and course title in English)	人間安全保障工学インターンシップ Internship for Human Security Engineering		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA	
Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Acquire practical approaches to problems concerning human security engineering.

[Course schedule and contents]

planning(1time)
Attending seminars, presentations at international conferences, and internships are planned by students for this class.

research and investigation(13times)
Students attend seminars, make presentations at international conferences, and carry out internships to get practical knowledge and experiences.

final report(1time)
Students need to submit a report summarizing what they did and what they got in the activities.

[Course requirements]

None

[Evaluation methods and policy]

Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

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)

[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.

Course number	G-ENG55 7X341 SE73				
Course title (and course title in English)	アドバンスド・キャップストーン・プロジェクト Advanced Capstone Project	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA		
Target year		Number of credits	8	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

Acquire practical approaches to problems concerning human security engineering.

[Course schedule and contents]

planning(1time)
Attending seminars, presentations at international conferences, and internships are planned by students for this class.

research and investigation(13times)
Students attend seminars, make presentations at international conferences, and carry out internships to get practical knowledge and experiences.

final report(1time)
Students need to submit a report summarizing what they did and what they got in the activities.

[Course requirements]

None

[Evaluation methods and policy]

Report

Continue to アドバンスド・キャップストーン・プロジェクト(2)↓↓↓

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.

Course number	G-ENG55 7X351 SE73		
Course title (and course title in English)	人間安全保障工学セミナーA Human Security Engineering Seminar A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

To master the practical method to approach actual problems related to human security engineering.

[Course schedule and contents]

Issue 1 setting (1 time)
Set issue 1 on human security engineering that each student studies.

Survey and progress report (1 time)
Each student conducts survey and research on selected issue 1.

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.

Task 2 setting (1 time)
Set issue 2 on human security engineering that each student studies.

Survey and progress report (1 time)
Each student conducts survey and research on selected issue 2.

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.

Issue 3 setting (1 time)
Set issue 3 on human security engineering to be studied by each student.

Survey and progress report (1 time)
Each student conducts survey and research on selected issu 3.

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)↓↓↓

人間安全保障工学セミナーA(3)

Course number	G-ENG55 7X352 SE73		
Course title (and course title in English)	人間安全保障工学セミナーB Human Security Engineering Seminar B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

To master the practical method to approach actual problems related to human security engineering.

[Course schedule and contents]

Issue 1 setting (1 time)
Set issue 1 on human security engineering that each student studies.

Survey and progress report (1 time)
Each student conducts survey and research on selected issue 1.

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.

Task 2 setting (1 time)
Set issue 2 on human security engineering that each student studies.

Survey and progress report (1 time)
Each student conducts survey and research on selected issue 2.

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.

Issue 3 setting (1 time)
Set issue 3 on human security engineering to be studied by each student.

Survey and progress report (1 time)
Each student conducts survey and research on selected issu 3.

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 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B(3)↓↓↓

人間安全保障工学セミナーB(3)

未更新

Course number	G-ENG56 6V202 SE77		
Course title (and course title in English)	微小電気機械創製学 Introduction to the Design and Implementation of Micro-Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,YOKOKAWA RYUUJI Graduate School of Engineering Senior Lecturer,BANERJEE, Amit

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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 fullfill 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.

[Course objectives]

Acquire the knowledge and skill to design and analyze a microsystem.

[Course schedule and contents]

* Tutorial on microsystem CAD software, 2times
Master CAD program for microsystem design and analysis which will be utilized to accomplish an assignment.
* Lecture and Task Introduction,2times
Learn basic knowledge necessary to design a microsystem/MEMS(Micro Electromechaical Systems) utilizing microfabrication technology.
* Design and analysis work, 4times
Analyze and design a microsystem by communicating with a team member
of HKUST.
* Presentation I, 2times
The designed device and its analyzed results is presented in detail by team in English.
* Evatuation of device, 3times
Evaluate the fabricated microsystem.
* Presentation II, 2times
The measured results and comparison between the analyzed results of the fabricated microsystem is presented by team in English.

[Course requirements]

Students are required to take the 10G204 course Microfabrication provided in 1st term.

[Evaluation methods and policy]

【Evaluation method】
Evaluation will be based on presentatins (60 points) and the end of the term assignments (40 points).
【Evaluation standard】
Presentations are evaluated with not only design, simulation and measurement results of device, but also

Continue to 微小電気機械創製学(2)↓↓↓

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) by the end of 1st term.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG76 53237 LJ13 G-ENG76 53237 LJ11 G-ENG76 53237 LJ12		
Course title (and course title in English)	情報システムデザイン Information Systems Design	Instructor's name, job title, and department of affiliation	Graduate School of Informatics Professor,Takayuki ITO Institute for Liberal Arts and Sciences Professor,TAJIMA KEISHI Part-time Lecturer,MATSUBARA SHIGEO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Thu.3	Class style	Lecture	Language of instruction	Japanese and English

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents]

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
Yoshikawa: yoshikawa@i.kyoto-u.ac.jp
Matsubara: 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.

Course number	G-ENG76 63291 LJ12　G-ENG76 63291 LJ24　G-ENG76 63291 LJ73		
Course title (and course title in English)	**防災・減災デザイン論** Designs for Emergency Management	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understand risk and crisis management processes to maximize the capability of organizational operational continuity and requirements for effective support information system in emergency management.

[Course schedule and contents]

[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

[Course requirements]

None

[Evaluation methods and policy]

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@dimsis.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@dimsis.dpri.kyoto-u.ac.jp)

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG76 63173 LE10

Course title (and course title in English)	計算論的学習理論 Computational Learning Theory	Instructor's name, job title, and department of affiliation	Graduate School of Informatics Professor,YAMAMOTO AKIHIRO Graduate School of Informatics Assistant Professor,KOBAYASHI YASUAKI

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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,1time,

[Course requirements]

None

[Evaluation methods and policy]

Continue to 計算論的学習理論(2)↓↓↓

計算論的学習理論(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.

未更新

Course number	G-ENG76 63178 LE10		
Course title (and course title in English)	統計的学習理論 Statistical Learning Theory	Instructor's name, job title, and department of affiliation	Graduate School of Informatics Professor,KASHIMA HISASHI Graduate School of Informatics Associate Professor,YAMADA MAKOTO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.1	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,4times,
,6times,
,5times,

[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.

未更新

Course number	G-ENG76 63217 LE11　G-ENG76 63217 LE13　G-ENG76 63217 LE10		
Course title (and course title in English)	分散情報システム Distributed Information Systems	Instructor's name, job title, and department of affiliation	Graduate School of Informatics Professor,YOSHIKAWA MASATOSHI Graduate School of Informatics Associate Professor,MA QIANG

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,10times,
,5times,

[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.

未更新

Course number	G-ENG76 60412 LJ44		
Course title (and course title in English)	デザインエスノグラフィ Design Ethnography	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,YAMAUCHI YUTAKA

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Ethnography is seen as one of the key methods for design. At minimum, designers need to understand the field in which they are to introduce their designs. For this, it is not enough to ask people; it is necessary to gain a first-hand understanding through experiencing the lives in the field. Through ethnography, designers can grasp taken-for-granted experiences and start to look at their problems from a fresh perspective. In this course, students will learn the basics of ethnography (e.g., how to write fieldnotes, how to make observations and how to analyze the data) and develop their skills through group projects. This course focuses on the ethnography part of design although in reality it cannot be separated from the rest of the design. Students are encouraged to take other courses on design so that they can fully exploit the insights gained through ethnography.

[Course objectives]

[Course schedule and contents]

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Continue to デザインエスノグラフィ(2)↓↓↓

デザインエスノグラフィ(2)

[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.

未更新

Course number	G-ENG76 50025 LE44		
Course title (and course title in English)	マーケティングリサーチ Marketing Research	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,HAN, Hyun Jeong

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.4,5	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG76 57425 SJ30　G-ENG76 57425 SJ46		
Course title (and course title in English)	心理システムデザイン演習 I Seminar on Psychology and Design Studies I	Instructor's name, job title, and department of affiliation	Graduate School of Education Professor,Emmanuel MANALO Graduate School of Education Associate Professor,TAKAHASHI YUUSUKE Graduate School of Education Professor,KUSUMI TAKASHI Graduate School of Education Professor,SAITOU SATORU Graduate School of Education Associate Professor,NOMURA MICHIO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Fri.2	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

This course aims to deepen studentsrsquo research content. Faculty and students will provide presentations and engage in mutual discussions of the latest research. This will help students acquire broader knowledge of diverse specialized disciplines. Students will also examine and discuss literature selected from related disciplines. The course will help students discover new directions for research by helping them plot their research themes on a time axis (the flow of studentsrsquo research from the past to the present) and on a space axis (the relationship of studentsrsquo research to research being conducted in neighboring disciplines). It will also help them reexamine their research in relation to these axes. This course has three objectives related to studentsrsquo research themes: (1) deepening studentsrsquo abilities to think so they can achieve higher standards; (2) deepening studentsrsquo understanding of the latest research trends in various specialized fields; (3) helping students acquire skills needed to report research in an interesting, easily-understandable way; and (4) helping students acquire skills required to conduct constructive discussions.

[Course objectives]

[Course schedule and contents]

,1time,
,14times,

[Course requirements]

None

[Evaluation methods and policy]

Continue to 心理システムデザイン演習 I (2)↓↓↓

心理システムデザイン演習 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.

未更新

Course number	G-ENG76 57426 SJ30　G-ENG76 57426 SJ46		
Course title (and course title in English)	心理システムデザイン演習II Seminar on Psychology and Design Studies II	Instructor's name, job title, and department of affiliation	Graduate School of Education Professor,Emmanuel MANALO Graduate School of Education Associate Professor,TAKAHASHI YUUSUKE Graduate School of Education Professor,KUSUMI TAKASHI Graduate School of Education Professor,SAITOU SATORU Graduate School of Education Associate Professor,NOMURA MICHIO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

This course aims to deepen studentsrsquo research content. Faculty and students will provide presentations and engage in mutual discussions of the latest research. This will help students acquire broader knowledge of diverse specialized disciplines. Students will also examine and discuss literature selected from related disciplines. The course will help students discover new directions for research by helping them plot their research themes on a time axis (the flow of studentsrsquo research from the past to the present) and on a space axis (the relationship of studentsrsquo research to research being conducted in neighboring disciplines). It will also help them reexamine their research in relation to these axes. This course has three objectives related to studentsrsquo research themes: (1) deepening studentsrsquo abilities to think so they can achieve higher standards; (2) deepening studentsrsquo understanding of the latest research trends in various specialized fields; (3) helping students acquire skills needed to report research in an interesting, easily-understandable way; and (4) helping students acquire skills required to conduct constructive discussions.

[Course objectives]

[Course schedule and contents]

,14times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

Continue to 心理システムデザイン演習II(2)↓↓↓

心理システムデザイン演習 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.

未更新

Course number	G-ENG76 57245 SJ46		
Course title (and course title in English)	心理デザインデータ解析演習 Seminar on Data Analysis in Psychology and Design Studies	Instructor's name, job title, and department of affiliation	Graduate School of Education Associate Professor,TAKAHASHI YUUSUKE

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

This course will review the major methods used in multivariate data analysis (factor analysis, regression analysis, structural equation modeling, etc.) of psychological data employed during the exploration of human cognition and design processes. The primary goal of this course is to increase studentsrsquo abilities to understand and perform these types of statistical analyses on their own experimental data. Students will learn to use a number of software packages (SPSS, R, etc.). In addition, students will acquire the skills required to write high-level academic papers.

[Course objectives]

[Course schedule and contents]

,1time,
,14times,

[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.

Course number	G-ENG76 57295 LJ30　G-ENG76 57295 LJ46						
Course title (and course title in English)	認知機能デザイン論 Design of Cognitive Functions			Instructor's name, job title, and department of affiliation	Graduate School of Advanced Integrated Studies in Human Survivability Professor,SEKIYAMA KAORU		
Target year		Number of credits	2	Year/semesters	2021/First semester		
Days and periods	Wed.4	Class style	Lecture	Language of instruction	English		

[Overview and purpose of the course]

This course introduces objective/empirical methods for understanding human mind (or cognition), by using psychological behavioral data together with brain activity data in cognitive neuroscience. To do so, we will examine several phenomena such as recognition of one ’ s own body, speech perception by face and voice, and working memory. In the examination, we will see connection between cognition and action (or body), and its plasticity as well as developmental and aging-related changes.

[Course objectives]

-Understand the objective/empirical methods to investigate cognitive function
-Understand the plastic and developmental aspects of mind, which is useful to deal with people in different ages and backgrounds

[Course schedule and contents]

1. Adaptive mind: Seeing and brain function
2. Experimenting body recognition (1)
3. Experimenting body recognition (2)
4. Body schema and its development
5. Development of brain and cognition
6. On experiments with reversing prisms
7. Brain imaging of cognition
8. Hearing sound and speech
9. Auditory-visual (AV) speech perception
10. Neural basis of interlanguage differences in AV speech perception
11. Processes of memory
12. Memory and brain
13. Cognitive aging
14. Lifestyles to protect our brain from aging
15. Summary and final remarks
(The contents is subject to change.)

Continue to 認知機能デザイン論 (2)↓↓↓

認知機能デザイン論 (2)

[Course requirements]
None

[Evaluation methods and policy]
Evaluated by class participation (20%), and midterm (40%) and final (40%) reports.

[Textbooks]
Handout will be given.

[References, etc.]
（Reference books）

Introduced during class

Specified in the classroom.

[Study outside of class (preparation and review)]
Expected to read introduced literature in advance and related literatures afterwards.

（Other information (office hours, etc.)）
This is an introductory course to neuroscience and psychological science.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG76 57294 SJ46　G-ENG76 57294 SJ63

Course title (and course title in English)	脳機能デザイン演習 Seminar on Brain Function and Design Studies	Instructor's name, job title, and department of affiliation	Graduate School of Education Associate Professor,NOMURA MICHIO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.2	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

This seminar, which is primarily rooted in neuroscience, is aimed at graduate students who are currently engaged in research or are interested in engaging in research related to cognition, emotion, and broader areas in the life sciences. Students will participate in a review of research that may serve as a background to studentsrsquo own areas of interest. This course will consider practical aspects involved in the study of human cognition at an advanced level. Topics include experiment planning, measurement of brain functions, data analysis and interpretation, and drafting and completion of research papers.

[Course objectives]

[Course schedule and contents]

,1time,
,14times,

[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.

未更新

Course number	G-ENG56 8X468 PJ18		
Course title (and course title in English)	問題発見型/解決型学習(FBL/PBL)S 1 Field based Learning/Problem based Learning (FBL/PBL) S1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

This seminar provides 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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

未更新

Course number	G-ENG56 8X469 PJ18		
Course title (and course title in English)	問題発見型/解決型学習(FBL/PBL)S２ Field based Learning/Problem based Learning (FBL/PBL) S2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	English

[Overview and purpose of the course]

This seminar provides 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.

[Course objectives]

Students will be able to acquire presentation and logical thinking skills.

[Course schedule and contents]

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 resutls.

[Course requirements]

None

[Evaluation methods and policy]

Based on Group Activity Reports and Personal Report

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Group activities

（Other information (office hours, etc.)）

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.

未更新

Course number	G-ENG56 8X477 PJ18		
Course title (and course title in English)	問題発見型/解決型学習(FBL/PBL)L１ Field based Learning/Problem based Learning (FBL/PBL) L1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

The FBL (Field based Learning) gives experience of the team learning about the process to find the solutions from the real situations of the contemporary, existing human society. Or the PBL (Problem based Learning) gives experience of the team learning about the process to solve the given, existing problems. These learnings will result in the implementation of design with understanding design theory and methodology.
For the FBL, (1) To discover the fundamental problems included in the structural conditions of the society, by observing and analyzing the existing society well, (2) To learn the design theory necessary for finding the problems, (3) To learn the design methodology necessary for finding the problems and To implement the methodology during the projects, (4) To designate the solvable problems in the reality.
For the PBL, (1) To learn the design theory necessary for solving the problems, (2) To learn the design methodology necessary for solving the problems and To implement the methodology during the projects, (3) To set up the concrete solutions available.

[Course objectives]

-Ability to find the problems in the existing society, and to designate the solvable problem, and to set up the concrete solutions available, by using the learnt design theory and design methodology
- Ability to promote the group works cooperatively with the participants of different background, and to communicate well, share the ideas.
- Ability to understand one ’ s own roles among the participants of the group works, and to inform others inside/outside the university #8211 namely the existing society #8211 of the contents of the group work

[Course schedule and contents]

The program will be updated every year, so the participants are requested to check the information on PandA. The PandA URL for the FBL/PBL L1+L2 is https://panda.ecs.kyoto-u.ac.jp/portal/site/6bb0ca95-bc43-4ee2-b062-8c591c6967e4.
The participants can discuss with the organizer (professor or associate professor) about the schedules according to the information.

[Course requirements]

None

[Evaluation methods and policy]

- Learning of the methodology for finding and solving the problems (evaluated through the interview or the report, 50%)

Continue to 問題発見型/解決型学習(FBL/PBL)L１ (2)↓↓↓

- Quality of the problem analysis and solution in result (evaluated through the interview or the report, 20%)
- The participants have to appear more than 80 % of the schedule.

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

There will be held the presentation time in the midst of the semester, and the participants will be able to get the feedback from the other project participants. All the participants will be requested to appear at the presentation time.

（Other information (office hours, etc.)）

The program will be updated every year, so the participants are requested to check the information on PandA.
The PandA URL for the FBL/PBL L1+L2 is https://panda.ecs.kyoto-u.ac.jp/portal/site/6bb0ca95-bc43-4ee2-b062-8c591c6967e4.
The Email address for the contact to the organizer will be shown in this URL. Appointments with the organizer should be made by the Email.
The participants can discuss with the organizer (professor or associate professor) about the schedules according to the information.

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG56 8X478 PJ18				
Course title (and course title in English)	問題発見型/解決型学習(FBL/PBL)L 2 Field based Learning/Problem based Learning (FBL/PBL) L2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN		
Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

The FBL (Field based Learning) gives experience of the team learning about the process to find the solutions from the real situations of the contemporary, existing human society. Or the PBL (Problem based Learning) gives experience of the team learning about the process to solve the given, existing problems. These learnings will result in the implementation of design with understanding design theory and methodology.
For the FBL, (1) To discover the fundamental problems included in the structural conditions of the society, by observing and analyzing the existing society well, (2) To learn the design theory necessary for finding the problems, (3) To learn the design methodology necessary for finding the problems and To implement the methodology during the projects, (4) To designate the solvable problems in the reality.
For the PBL, (1) To learn the design theory necessary for solving the problems, (2) To learn the design methodology necessary for solving the problems and To implement the methodology during the projects, (3) To set up the concrete solutions available.

[Course objectives]

-Ability to find the problems in the existing society, and to designate the solvable problem, and to set up the concrete solutions available, by using the learnt design theory and design methodology
- Ability to promote the group works cooperatively with the participants of different background, and to communicate well, share the ideas.
- Ability to understand one ’ s own roles among the participants of the group works, and to inform others inside/outside the university #8211 namely the existing society #8211 of the contents of the group work

[Course schedule and contents]

The program will be updated every year, so the participants are requested to check the information on PandA. The PandA URL for the FBL/PBL L1+L2 is https://panda.ecs.kyoto-u.ac.jp/portal/site/6bb0ca95-bc43-4ee2-b062-8c591c6967e4.
The participants can discuss with the organizer (professor or associate professor) about the schedules according to the information.

[Course requirements]

None

[Evaluation methods and policy]

- Learning of the methodology for finding and solving the problems (evaluated through the interview or the report, 50%)
- Quality of the problem analysis and solution in result (evaluated through the interview or the report, 20%)

Continue to 問題発見型/解決型学習(FBL/PBL)L 2 (2)↓↓↓

- The participants have to appear more than 80 % of the schedule.

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

There will be held the presentation time in the midst of the semester, and the participants will be able to get the feedback from the other project participants. All the participants will be requested to appear at the presentation time.

（Other information (office hours, etc.)）

The program will be updated every year, so the participants are requested to check the information on PandA.
The PandA URL for the FBL/PBL L1+L2 is https://panda.ecs.kyoto-u.ac.jp/portal/site/6bb0ca95-bc43-4ee2-b062-8c591c6967e4.
The Email address for the contact to the organizer will be shown in this URL. Appointments with the organizer should be made by the Email.
The participants can discuss with the organizer (professor or associate professor) about the schedules according to the information.

*Please visit KULASIS to find out about office hours.

Course number	G-ENG56 8X479 PB18

Course title (and course title in English)	フィールドインターンシップL（デザイン学） Filed Internship L	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

フィールドインターンシップは、「現場の教育力」を活用する試みで、複数の専門領域に関わる国際的・社会的課題に対して、数週間から数か月フィールドに滞在し、グループで取り組む。各自でインターンシップ先を探し，申し込む。事前に計画書を提出した上でインターンシップに参加し，インターンシップ終了後にはレポートを提出し、実習報告会で発表することを必須とする。国内外を問わず履修生を現地に派遣する。個人が中心であったこれまでのインターンシップとは異なり、グループ活動を通じてリーダーシップの養成を狙う。海外国際機関への派遣やイアエステ、アイセック、ブルカノス・イン・ヨーロッパ等による海外企業での研修も対象とする。
本科目では以下を目的とする。 (1) 現場の状況を観察し、分析することで、状況の構造を理解し、根本原因となっている解くべき問題を発見すること、(2) これまで修得したデザイン理論とデザイン手法を、現場におけるプロジェクトの中で実践すること、(3) 現場において現実的に解決可能な問題を定義し、実現可能な解決策を立案すること。

[Course objectives]

フィールドインターンシップは、実問題を抱える現場において、これまでに学んだデザイン理論とデザイン手法を実践することを到達目標とする。

[Course schedule and contents]

イントロダクション,1回
本科目の概要と、プロジェクトの進め方について説明する。また、知財の扱いや危機管理教育についても説明する。

実践,13回
プロジェクト毎にインターンシップ進める。プロジェクトによって、フィールドでの活動を数回に分けるなどの実施形態があるので、それに従うこと。

発表会,1回
プロジェクト毎に成果を発表する。

[Course requirements]

現地滞在型の集中演習のため日程等の条件にあわせられる履修者に限る

[Evaluation methods and policy]

社会で必要とされる柔軟性や創造性が涵養されたか、グループワークに不可欠な柔軟性と自己主張性の啓発がなされたか、国際的視野の養成と国際的相互情報伝達能力の向上を成し遂げたか、等を基準に単位認定を行う。

Continue to フィールドインターンシップL（デザイン学）(2)↓↓↓

1　問題発見や解決に用いるデザイン理論やデザイン手法の実践状況　5割（レポートや試問による）
2　問題発見や解決結果の質　2割（レポートや試問による）
3　チームへの貢献　3割（教員もしくは派遣先担当者の観察による）

[Textbooks]

インターンシップで用いる資料は、適宜配布する。

[References, etc.]

（Reference books）
『フィールド情報学入門』共立出版 2009. 『Filed Informatics』Springer 2011.

[Study outside of class (preparation and review)]

インターンシップでは、実社会に関わって実践的な取り組みを行う。そのため、開始前には対象に関わる情報の収集、地域理解に関する基礎的理解、等を行うこと。また、それらを参加者間で共有すること。インターンシップを実践中にあっても、随時新たに発見される事象について検討・参加者間で共有し、実施計画のさらなる発展を図ることを必須とする。

（Other information (office hours, etc.)）

本科目でのインターンシップの実施に関わる情報については、随時、PandA上のコースサイトにて連絡する。履修希望者あるいは履修生はよく見てください。実施するフィールドインターンシップのそれぞれの担当教員の連絡先メールアドレスは、別途通知する。

*Please visit KULASIS to find out about office hours.

Course number	G-ENG56 8X480 PB18		
Course title (and course title in English)	リサーチインターンシップL（デザイン学） Research-Intensive Abroad Internship L	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

リサーチインターンシップは、海外の研究機関の研究室に数週間から数か月滞在し、現地研究員との共同研究を通じて、デザイン学の視点から既存の学術分野を横断する境界領域において真理を探求でき、新しい研究分野において研究チームを組織してリードできる能力の涵養を目指す。そのために、国際連携のパートナーとなっている外国著名研究機関に対して、各自がインターンシップ先を探し、共同研究の提案、計画、滞在中の宿舎等についての協議を行いながら、受け入れ先研究機関を決定する。事前に研究計画書を提出し、関係教員の事前審査を受けた上でインターンシップを実施し、インターンシップ終了後にはレポートを提出し、報告会で発表することを必須とする。各自の研究成果のみならず、派遣先研究機関への貢献内容についても評価に含める。なお、海外連携大学において実施される短期集中型のスクールへの参加も対象とする。
本科目では、(1) 複数の異分野統合によるデザイン学に係る研究テーマの提案であること、(2) 海外研究機関との共同研究が計画に盛り込まれていること、の基準に基づいて、派遣先海外研者を含む内外の審査委員のピアレビューで派遣決定を行う。派遣の決まった課題については、派遣前の研究計画審査（アセスメント）、派遣中の進捗報告（モニタリング）、そして派遣後の成果報告・評価（エバルエーション）、の３段階の評価を行う。

[Course objectives]

本科目は、(1) 複数の異分野統合によるデザイン学に係る研究テーマの提案であること、(2) 海外研究機関との共同研究が計画に盛り込まれていること、を基準にして派遣先での共同研究を実施するためのインターンシップである。海外研究者との共同研究を通して、外国の異文化ならびに研究領域の異分野を背景とする中での相互情報伝達のための対話力、交渉力を涵養する。さらに、自国文化ならびに自身の専門分野に根ざした確たる学識を有した上で、異文化・異分野を理解できる協調性と，個別領域の「知の相互関係」を捉えることのできる異分野横断的なビジョンを涵養する。

[Course schedule and contents]

イントロダクション、１回
授業の目的・到達目標について理解しインターンシップの内容について検討、履修者ごとに実施計画を確定する。また、知財の扱いや危機管理教育についても説明する。
実践、13回
実施計画に基づき派遣申請されたインターンシップを随時実施する。
発表、１回
履修生はそれぞれのインターンシップについての報告を提出しそれらの研究成果を発表しフィードバックを行う。

Continue to リサーチインターンシップL（デザイン学）(2)↓↓↓

リサーチインターンシップL（デザイン学） (2)

[Course requirements]

インターンシップであるため、日程・開催場所等にあわせられる履修者に限る

[Evaluation methods and policy]

共同研究計画の内容　5割
派遣中の進捗報告　2割
共同研究の成果と派遣先研究機関への貢献　3割（教員もしくは派遣先受入教員の評価による）

[Textbooks]

インターンシップで用いる資料は、適宜配布する。

[References, etc.]

（Reference books）
授業時に適宜指示する

[Study outside of class (preparation and review)]

インターンシップの実施計画の内容に応じて、必要な予習・復習の内容を随時指示する。

（Other information (office hours, etc.)）

本科目でのインターンシップの実施に関わる情報については、随時、PandA上のコースサイトにて連絡する。履修希望者あるいは履修生はよく見てください。

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG01 7X481 SJ18				
Course title (and course title in English)	デザイン学特別演習I Design Science Exercise, Adv. 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANKI KIYOKO		
Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG01 7X482 SJ18

Course title (and course title in English)	デザイン学特別演習II Design Science Exercise, Adv. 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KANKI KIYOKO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

Course number	G-ENG01 8X483 PJ18		
Course title (and course title in English)	**オープンイノベーション実習１** Open Innovation Practice 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

社会の実問題を発見し解決するデザイン活動のために、関係する専門家あるいはステークホルダーに依頼し、オープンイノベーションのためのチームを構成し、ワークショップを連続的に実施することで目標を達成する。履修者の役割は、専門家として問題解決や問題発見に参加することではなく、あくまでも、上記のオープンイノベーションのためのチームを構成しマネジメントすることである。これによって、履修者のコミュニケーション能力、マネジメント能力を鍛えるとともに、実践を通じてデザイン活動を成功に導くためのデザイン理論やデザイン手法を身に付けさせる。

本科目では以下を目的とする。(1) 与えられた実世界の状況を観察し、分析することで、状況の構造を理解し、根本原因となっている解くべき問題を発見できる専門家、ステークホルダーを同定し、オープンイノベーションのためのチームを構成できること、(2) 問題を発見し解決するにあたって必要なデザイン理論、デザイン手法を、プロジェクトのマネジメントの中で実践し、オープンイノベーションのためのチームによる、問題の定義と解決を支援できること。

[Course objectives]

オープンイノベーション実習を通して、デザインの実践をマネジメントし、デザイン理論とデザイン手法を習得することを到達目標とする。

[Course schedule and contents]

イントロダクション,1回
本演習の概要と、プロジェクトの進め方について説明する。また、知財の扱いについても説明する。

実践,13回
プロジェクト毎にオープンイノベーション実習を進める。プロジェクトによって、毎週実施、離散的な実施、集中的な実施などの実施形態があるので、それに従うこと。

発表会,1回
プロジェクト毎に成果を発表する。

[Course requirements]

問題発見型/解決型実習(FBL/PBL) を経験していること。
デザイン学共通科目「デザイン方法論」の単位を取得していること が望ましい。

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)

[Evaluation methods and policy]

問題発見や解決プロセスのマネジメント手法の修得状況　5割（レポートや試問による）
マネジメントの質　2割（レポートや試問による）
オープンイノベーションチームへの貢献　3割（教員の観察による）

[Textbooks]

実習で用いる資料は、適宜配布する。

[References, etc.]

（Reference books）
実習で用いる資料は、適宜配布する。

（Related URLs）

(授業時に指示する)

[Study outside of class (preparation and review)]

授業時に指示する

（Other information (office hours, etc.)）

本科目の履修・実習計画の相談に関わる情報については、随時、PandA上のコースサイトにて連絡する。履修希望者あるいは履修生はよく見てください。実施する実習のそれぞれの直接担当教員の連絡先メールアドレスは、別途通知する。

*Please visit KULASIS to find out about office hours.

Course number	G-ENG01 8X484 PJ18		
Course title (and course title in English)	**オープンイノベーション実習２** Open Innovation Practice 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

社会の実問題を発見し解決するデザイン活動のために、関係する専門家あるいはステークホルダーに依頼し、オープンイノベーションのためのチームを構成し、ワークショップを連続的に実施することで目標を達成する。履修者の役割は、専門家として問題解決や問題発見に参加することではなく、あくまでも、上記のオープンイノベーションのためのチームを構成しマネジメントすることである。これによって、履修者のコミュニケーション能力、マネジメント能力を鍛えるとともに、実践を通じてデザイン活動を成功に導くためのデザイン理論やデザイン手法を身に付けさせる。

本科目では以下を目的とする。(1) 与えられた実世界の状況を観察し、分析することで、状況の構造を理解し、根本原因となっている解くべき問題を発見できる専門家、ステークホルダーを同定し、オープンイノベーションのためのチームを構成できること、(2) 問題を発見し解決するにあたって必要なデザイン理論、デザイン手法を、プロジェクトのマネジメントの中で実践し、オープンイノベーションのためのチームによる、問題の定義と解決を支援できること。

[Course objectives]

オープンイノベーション実習を通して、デザインの実践をマネジメントし、デザイン理論とデザイン手法を習得することを到達目標とする。

[Course schedule and contents]

イントロダクション,1回
本演習の概要と、プロジェクトの進め方について説明する。また、知財の扱いについても説明する。

実践,13回
プロジェクト毎にオープンイノベーション実習を進める。プロジェクトによって、毎週実施、離散的な実施、集中的な実施などの実施形態があるので、それに従うこと。

発表会,1回
プロジェクト毎に成果を発表する。

[Course requirements]

問題発見型/解決型実習(FBL/PBL) を経験していること。
デザイン学共通科目「デザイン方法論」の単位を取得していることが望ましい。

[Evaluation methods and policy]

問題発見や解決プロセスのマネジメント手法の修得状況　5割（レポートや試問による）
マネジメントの質　2割（レポートや試問による）

Continue to オープンイノベーション実習２(2)↓↓↓

オープンイノベーション実習２(2)

オープンイノベーションチームへの貢献　3割（教員の観察による）

[Textbooks]

実習で用いる資料は、適宜配布する。

[References, etc.]

（Reference books）

実習で用いる資料は、適宜配布する。

（Related URLs）

(授業時に指示する)

[Study outside of class (preparation and review)]

授業時に指示する

（Other information (office hours, etc.)）

本科目の履修・実習計画の相談に関わる情報については、随時、PandA上のコースサイトにて連絡する。履修希望者あるいは履修生はよく見てください。実施する実習のそれぞれの直接担当教員の連絡先メールアドレスは、別途通知する。

*Please visit KULASIS to find out about office hours.

未更新

Course number	G-ENG56 56122 SE47　G-ENG56 56122 SE46		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Education Professor,Emmanuel MANALO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3daystimes,

[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.

未更新

Course number	G-ENG56 53254 LJ10		
Course title (and course title in English)	フィールド分析法 Field Analysis	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,3times,
,4times,
,4times,
,3times,

[Course requirements]

None

Continue to フィールド分析法(2)↓↓↓

フィールド分析法(2)

[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.

未更新

Course number	G-ENG76 63165 LE12		
Course title (and course title in English)	パターン認識特論 Pattern Recognition, Adv.	Instructor's name, job title, and department of affiliation	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

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,3times,
,3times,
,3times,
,3times,
,3times,

[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.

未更新

Course number	G-ENG76 63126 LE12		
Course title (and course title in English)	言語情報処理特論 Language Information Processing, Adv.	Instructor's name, job title, and department of affiliation	Graduate School of Informatics Professor,KUROHASHI SADAO Academic Center for Computing and Media Studies Professor,MORI SHINSUKE Graduate School of Informatics Assistant Professor,MURAWAKI YUGO

Target year		Number of credits	2	Year/semesters	2021/First semester
Days and periods	Mon.3	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,2times,
,2times,
,2times,
,2times,
,2times,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

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.

未更新

Course number	G-ENG57 5X604 LJ60		
Course title (and course title in English)	材料化学基礎 Basic Material Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KONDOU TERUYUKI Graduate School of Engineering Associate Professor,KIMURA YUU

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1-3times,
,4-6times,
,7-8times,
,9-11times,
,12-13times,
,14times,

[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.

未更新

Course number	G-ENG57 5X605 LJ60		
Course title (and course title in English)	生物分子解析学 Molecular Analysis of Life	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO

Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Fri.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1-6times,
,7-9times,
,10-13times,
,14-15times,

[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.

未更新

Course number	G-ENG57 6X671 EB77		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG57 6X672 EB77		
Course title (and course title in English)	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	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO

Target year		Number of credits	4	Year/semesters	2021/Intensive, year-round
Days and periods	Intensive	Class style	Experiment	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,30times,

[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.

未更新

Course number	G-ENG57 6X681 SJ77		
Course title (and course title in English)	総合医療工学分野セミナーA(修士) Integrated Medical Engineering Seminar A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO

Target year		Number of credits	1	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG57 6X682 SJ77		
Course title (and course title in English)	総合医療工学分野セミナーB(修士) Integrated Medical Engineering Seminar B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO

Target year		Number of credits	1	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG77 6X683 SJ77		
Course title (and course title in English)	総合医療工学分野特別セミナーA Special Seminar A on Integrated Medical Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO

Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG77 6X684 SJ77		
Course title (and course title in English)	総合医療工学分野特別セミナーB Special Seminar B on Integrated Medical Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG77 6X685 SJ77				
Course title (and course title in English)	総合医療工学分野特別セミナーC Special Seminar C on Integrated Medical Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO		
Target year		Number of credits	2	Year/semesters	2021/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG77 6X686 SJ77		
Course title (and course title in English)	総合医療工学分野特別セミナーD Special Seminar D on Integrated Medical Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MORI YASUO

Target year		Number of credits	2	Year/semesters	2021/Intensive, Second semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,15times,

[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.

未更新

Course number	G-ENG76 57295 LJ46				
Course title (and course title in English)	デザイン心理学特論 Advanced Studies: Cognitive Sciences	Instructor's name, job title, and department of affiliation	Kokoro Research Center Professor,UCHIDA YUKIKO		
Target year		Number of credits	2	Year/semesters	2021/Second semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Language divides the world by the use of symbols known as words. However, how do children learn to use language? How do children change as they acquire language? How dependent is thought on language? How does thought differ among speakers of different languages? In this course, students will consider the following questions by engaging in experimental research in cognitive science: (1) what are the processes involved in child language acquisition; (2) what are the processes involved in the development of concepts; (3) what kinds of relationships exist between language and concept learning; and (4) what kinds of relationships exist between language and thought?

[Course objectives]

[Course schedule and contents]

,15times,

[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.