AY 2017-2018

COURSE TITLES OFFERED IN ENGLISH - DOCTORAL PROGRAM

Subject Code	Lecture Subject Title	Lecturer	Hours per Week		Credits	Note
			Spring Semester	Fall Semester		
8023000	Socio-Environmental Energy Science, Adv. (Advanced Seminar on Socio-Environmental Energy Science)	(Omnibus Lecture)		2	2	
6214000	Plasma Simulation Methodology	Kishimoto		2	2	
8024000	Zero-emission Social System	(SES faculty)	(2)		2	intensive (whole year)
8025000	Present and Future Trends of Fundamental Energy Science,Adv. (Present and Future Trends of FES,Adv.)	(FES faculty)		2	2	intensive (Fall)
8022000	Advanced Energy Conversion Science	(ECS faculty)		2	2	
8026000	Advanced Energy Science and Technology	(EST faculty)		2	2	

INFORMATION ON JAPANESE COURSES

The course information of the GSES courses taught in Japanese will be found on KULASIS and on the GSES' Graduate School Handbook and Syllabi'. （大学院学修要覧）

AY 2017 FALL SEMESTER COURSE SYLLABI – DOCTORAL PROGRAM

Code	8023000		
Course title <English>	Socio-Environmental Energy Science, Adv. Advanced Seminar on Socio-Environmental Energy Science	Affiliated department, Job title, Name	SES faculty
Grade alloted	Doctoral	Number of credits	2
Course offered year/period	2017 Fall		
Day/period	Friday, 2nd	Class style	Lecture
Language	English		

[Outline and Purpose of the Course]

To solve various problems of energy and environment, it is necessary to have broad knowledge and perspectives to analyze problems in a comprehensive and multifaceted manner. In this seminar, the professors and associate professors in the Department of Socio-environmental Energy Science provide omnibus lectures on wide-ranging leading research topics related to socio-environmental energy science.

[Course Goals]

By the end of the course, students will have advanced knowledge and a high level understanding of leading research topics related to socio-environmental energy science, and will be able to analyze various energy problems from engineering, sociological, political, economical, biological and environmental perspectives.

[Course Schedule and Contents]

The course will cover the following topics. The order will be announced on the first day of class.

1. Ecology, Economy, and Environmental Consciousness (Prof. Keiichi Ishihara)
2. Energy Environmental Issues and Technology (Assoc. Prof. Hideyuki Okumura)
3. Introduction to "Energy Systems Study" (Prof. Tetsuo Tezuka)
4. Critical Materials and Unconventional Resources for Energy (Assoc. Prof. Benjamin McLellan)
5. Pyrolysis Mechanism as an Underlying Principle of Thermochemical Conversion of Biomass (Assoc. Prof. Haruo Kawamoto)
6. Risk Communication (Prof. Hiroshi Shimoda)
7. Advanced Technologies for Design, Operation and Maintenance of Power Plants (Assoc. Prof. Hirotake Ishii)
8. Atmospheric Environmental Problems in Asia I (Prof. Susumu Tohno)
9. Atmospheric Environmental Problems in Asia II (Assoc. Prof. Takayuki Kameda)
10. Energy Policy of Japan and Other Leading Countries (Prof. Hirotoshi Unesaki)
11. Strategy of Earthquake Disaster Mitigation (Prof. Katsuhiro Kamae)
12. Earthquake Motions and Earthquake Resistant Design (Assoc. Prof. Hirotoshi Uebayashi)
13. Risk Management of Information Society (Prof. Jun Yoshida)

[Class requirement]

None

[Method, Point of view, and Attainment levels of Evaluation]

The evaluation is based upon these factors. Out of a possible 100 points:
1.Short reports (80 points). The report subject will be provided in each lecture.
2.Class participation (20 points).

[Textbook]

Textbook (Advanced Seminar on Socio-Environmental Energy Science) will be distributed on the first day of class. Additional handouts may be distributed in class.

[Reference book, etc.]

Reference books will be introduced in class.

[Regarding studies out of class (preparation and review)]

Students are recommended to read the textbook in advance of the lectures.

[Others (office hour, etc.)]

Code	6214000	Affiliated department, Job title, Name	Y. Kishimoto
Course title <English>	Plasma Simulation Methodology		

Grade alloted	Doctoral	Number of credits	2	Course offered year/period	2017Fall
Day/period	Tuesday, 4th	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

This lecture aims at formally introducing basic statistical description of wide class of plasma. Characteristics of individual and collective behaviors of plasmas and that of associated fluctuation and dissipation are studied following kinetic modeling, which are the basis of numerical simulation of plasmas in magnetically confined fusion plasmas, laser-plasma interaction, space plasmas and astrophysical physics. Specific examples of simulation using large scale super-computer such as turbulent transport in fusion plasmas and high power laser-matter interaction are presented and explained.

[Course Goals]

1.Understanding of plasma based on kinetic model and of the individual and collective characteristics.
2.Understanding of the dispersion relation in plasma and specifically wave-particle interaction emphasizing on Landau damping.
3.Understanding of the characteristics of fluctuation and dissipation in plasmas based on the statistical approach and the role on plasma numerical simulation.
4.Understanding of the present status of large scale computer simulation

[Course Schedule and Contents]

The class will be arranged as a seminar style according to following subjects.
1.Definition of plasma and the concept of Debye shielding and plasma oscillation(2 weeks)
2.Kinetic description of plasmas leading to dispersion relation (2 weeks)
3.Collective nature of plasma emphasizing on Landau damping (3 weeks)
4.Fluctuation and dissipation of plasma and their kinetic description (3 weeks)
5.Simulation methodology of plasma based on kinetic and fluid approach (2 weeks)
6.Example of fundamental plasma simulation based on kinetic and fluid model
(2 weeks)
Note: Example of computer simulation is present in each class

[Class requirement]

None

[Method, Point of view, and Attainment levels of Evaluation]

Paper examination and report

[Textbook]

Introduced in the classes

[Reference book, etc.]

（Reference book）
・S.Ichimaru, Basic Principle of Plasma Physics:A Statistical Approach, Frontiers in Physics Lecture Note Series
・L. Landau,"On the vibration of the Electric Plasma", J.Phys.U.S.S.R.10, 25 (1946)

[Regarding studies out of class (preparation and review)]

Basic knowledge: Electromagnetics; Fundamental course of plasma physics.

[Others (office hour, etc.)]

Code	8025000	Affiliated department, Job title, Name	FES faculty
Course title <English>	Present and Future Trends of FES, Adv. Present and Future Trends of Fundamental Energy Science, Adv.		

Grade alloted	Doctoral	Number of credits		Course offered year/period	2017Fall
Day/period	Intensive	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

This course offers a series of the latest topics in fundamental energy science.

[Course Goals]

Principal attainment targets are to:
1. promote student's ability to comprehend the newest research trend and critically read previously existing literature in fundamental energy science;
2. enhance student's ability to strive for the originality in conducting a research work and properly consider the logic and constitution as well as the notation in writing a technical article.

[Course Schedule and Contents]

The main topics are as following:
1. energy reaction chemistry
2. functional solid state science
3. solid state energy chemistry
4. fundamental fusion science
5. electromagnetic energy
6. plasma dynamics
7. fusion energy control
8. high temperature plasma physics
9. materials reaction chemistry
10. molecular chemical engineering
11. composite materials chemistry
12. energy and material circulation
13. fundamental neutron science
14. heat transport

[Class requirement]

None

[Method, Point of view, and Attainment levels of Evaluation]

Report

[Textbook]

Not used

[Reference book, etc.]

Introduced in classes

[Regarding studies out of class (preparation and review)]

It will be given based on the guideline in each laboratory.

[Others (office hour, etc.)]

Code	8022000	Affiliated department, Job title, Name	ECS faculty
Course title <English>	Advanced Energy Conversion Science		

Grade alloted	Master's / Doctoral	Number of credits	2	Course offered year/period	2017 Fall
Day/period	Wednesday, 3rd	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

Subjects on the conversion, control and utilization of various kinds of energy from viewpoints of science and engineering are offered.

[Course Goals]

To understand subjects on the conversion, control and utilization of various kinds of energy

[Course Schedule and Contents]

Latest topics about energy conversion systems and their functional design are lectured in an omnibus class.

・Thermal Efficiency and Pollutant Emissions in Internal Combustion Engines
・Laser Diagnostics for Combustion Research
・Alternative Fuels in Combustion Systems
・Ceramics and Their Applications to Energy-Related Machineries
・Energy Components and High Temperature Machine Design
・Nondestructive Evaluation for Energy Equipment and Materials
・Fusion Energy Conversion
・Nuclear Energy Materials
・Energy Conversion System for Electromagnetic Waves and Particle Beam
・Recent Progress in Fusion Structural Materials R&D
・Modeling of Radiation Damage Processes in Fusion Materials

[Class requirement]

none

[Method, Point of view, and Attainment levels of Evaluation]

Attendance and report

[Textbook]

Additional articles and documents are delivered if necessary.

[Reference book, etc.]

Reference books are introduced in class.

[Regarding studies out of class (preparation and review)]

To be announced in class.

[Others (office hour, etc.)]

Code	8026000	Affiliated department, Job title, Name	EST faculty
Course title <English>	Advanced Energy Science and Technology		

Grade alloted	Master's / Doctoral	Number of credits	2	Course offered year/period	2017 Fall
Day/period	Wednesday, 3rd	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

Purpose: This subject covers the essences of advanced energy science & technology. The basic principles are lectured of mineral resources and energy exploitation, physical chemistry, metallurgy and material science, fluid dynamics and heat transfer, mechanics, metallurgy and recycling, energy conversion and storage, fusion reactor materials design, microelectronics, laser engineering and space energy and resources. Attention is given to focus to establish environmentally friendly process technologies to sustain the development of our society. Each lecture ends with a requirement of report assignment.

[Course Goals]

・To study scientific and technical knowledge
on various researches related to the energy science and technology
and examples of approaches from science and engineering viewpoints
in energy- and environment-issues
・To establish basement of experise relevant to the Energy Science through report assignments

[Course Schedule and Contents]

Research topics in various research fields of the department are provided
in omnibus style. Contents and order of lectures depend on situation in each academic year,
and details of this subject, such as lecture schedule and lecturers, are posted and announced.

Example of contents:
・Energy Materials Research and Crystal Orientation Techniques
・Thermal Science in Advanced Energy System
・Recent R&D on Light Metallic Materials
・Recycling of Steel
・Recent Recycling Issues
・Plasticity of Environmentally-Friendly Metals
・Material Behavior under combined corrosion and tribological loading (tribocorrosion)
・Physics of Energy Materials and Its Application to Advanced Energy Systems
・Advanced Laser Development and Applications
・Generation and Application of Quantum Radiation Energy

[Class requirement]

[Method, Point of view, and Attainment levels of Evaluation]

Report and performance (to be explained in class)

[Textbook]

Distributed in classes if necessary

[Reference book, etc.]

To be announced in class.

[Regarding studies out of class (preparation and review)]

None

[Others (office hour, etc.)]