[Title]			[Instructor]		
System Solution Engineering			Masakazu Takahashi / Yoshimichi Watanabe		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417090	2	Information and Mechanical System Engineering	2nd Semester	Mon.／IV	Japanese

[Outline and purpose]

System solution engineering is a research domain which aims at construction of the business model based on information communication technology. Nowadays, the system solution is used as the word with the wide meaning which includes system development, construction of information infrastructure, security measures, consulting of the problems concerning business management.

This course develops the outline of system solution engineering, the fundamental knowledge to construct new business model or system, fundamental knowledge and techniques and skills for providing the solution services, analytical problems solving, design-problem solving, and the quality assurance of system solution.

[Objectives]

1. to understand the fundamental knowledge.
2. to understand the technology and skill which are needed in order to provide solution services.
3. to understand analytical problem solving and design-problem solving
4. to understand the quality assurance of system solutions
5. to understand matters required in order to develop a high quality solution and to acquire the means for constructing such a solution

[Requirements]

a grounding in fundamental knowledge of software engineering, information processing, and quality management

[Evaluation]

report : 50%
discussion : 50%

[Textbooks]

[References]

[Schedule]

1. Concept of System Solution
2. Basic Technologies Supporting System Solution
   (1) Information technology
   (2) Analytical problem solving and design-problem solving
   (3) Quality assurance and customer satisfaction
3. Practical system solutions
   (1) The solution in a computer vender
   (2) The solution in a software provider
   (3) The solution in an information communication common carrier
4. Future works of system solution

[Title]			[Instructor]		
Advanced Computing Systems			Tomo Munehisa / Tomohiro Suzuki		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417130	2	Information and Mechanical System Engineering	1st Semester	Mon.／II	Japanese

[Outline and purpose]

It is required to use the high-performance computer for recent large-scale scientific computing. In order to squeeze the performance of the latest computer, we should understand its architecture.

Many scientific computing are summarized to solve a linear system. Various algorithms are developed to solve a large-scale linear system.

In this lecture, we aim to learn the technique and the knowledge of various large-scale scientific computing with high-performance computer.

[Objectives]

1. To understand the computer architecture to optimize the implementation of scientific computing
2. To learn the technique of optimization
3. To learn the mathematical basis of scientific computing

[Requirements]

Programming skill (C or C++)

[Evaluation]

Homework: 50%
Presentation: 50%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Processor architecture of high-performance computer
3. Application technology of parallel computer
4. Solving linear system of dense matrices
5. Solving linear system of sparse matrices 1
6. Solving linear system of sparse matrices 2
7. Solving eigenvalue problem for general symmetric matrices
8. Solving eigenvalue problem for general non-symmetric matrices 1
9. Solving eigenvalue problem for general non-symmetric matrices 2
10. Implementation and optimization 1
11. Implementation and optimization 2
12. Implementation and optimization 3
13. Presentation 1
14. Presentation 2
15. Presentation 3

[Title]			[Instructor]		
Advanced Computer Networks			Hidetoshi Mino		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417140	2	Information and Mechanical System Engineering	2nd Semester	Mon.／II	Japanese

[Outline and purpose]

In this course students learn principles and design methodologies in computer networks through discussions and hands-on labs. We focus on redundancy and dependability of large-scale networks, and students will acquire essential knowledge and skills needed to be a network administrator in large scale campuses or in network service providers. We also deal with multicast technologies, Quality of Service, security issues, and IPv6 transition strategies, which have greater importance in the near future Internet.

[Objectives]

1. to be able to design, implement, and troubleshoot intermediate-scale computer networks.
2. to be able to address security issues in modern computer networks.

[Requirements]

Students are expected to have knowledge of IP routing and IPv4 addressing.

[Evaluation]

report : 50%
discussion : 50%

[Textbooks]

Online materials will be provided.

[References]

[Schedule]

1. Routing protocols
2. LAN protocols
3. Network design – expandability
4. Network design – redundancy and high availability
5. Multi-casting
6. QoS(Quality of Service)
7. VPN(Virtual Private Network)
8. IPv6 and its transition technologies

[Title]			[Instructor]		
Semantic Media Processing			Ryutarou Ohbuchi, Yoshimi Suzuki, Tsutomu Tanzawa, Hiromitsu Nishizaki		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417150	2	Information and Mechanical System Engineering	1st Semester	Mon.／III	Japanese

[Outline and purpose]

A student who attends this course would learn methodologies and techniques for analysis, comparison, retrieval, classification, recognition, and understanding of data in various media data types, including text, audio, and image.

[Objectives]

Understanding of fundamental methodologies and techniques for analysis, comparison, retrieval, classification, recognition, and understanding of data in various media data types, including text, audio, and image.

[Requirements]

The student is expected to have graduate-level knowledge and skill in linear algebra, information theory, programming, algorithms and data structure, and also in machine learning. In addition, the students is expected to know methods to process one or more of the audio, image, and text media types.

[Evaluation]

Report, project presentation : 50%
Discussion : 50%
Students are graded by the project report and presentation, in addition to class contribution in the form of discussion, etc.

[Textbooks]

[References]

Reading materials will be given by the instructors.

[Schedule]

1. Introduction
2, 3, 4. Analyzing multiple media data types
5. Project announcement
6, 7, 8, 9. Machine learning for media data analysis
10, 11, 12 Semantic media processing
13, 14, 15 Project presentation

[Title]			[Instructor]		
Advanced Optical Sensing and Control Engineering			Satoshi Honma		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417291	2	Information and Mechanical System Engineering	1st Semester	Fri.／II	English／Japanese

[Outline and purpose]

Optical network and measurement systems are used in a highly information-based society. The systems are constructed of various optical sensors and controlling devices. It is important to study characteristic of light for understanding the mechanism of optical sensing and controlling device.

The controlling method of optical intensity, phase, and direction are introduced in this course. In particular, electro-optic effect, non-linear optical effect, holography is discussed. The applications to optical sensing, measuring, memory, and communications are also introduced.

[Objectives]

1. to understand optical characteristic in free space and optical fiber
2. to understand mechanism of the optical sensor and optical controller

[Requirements]

a grounding in optics and electromagnetism

[Evaluation]

homework：20%
examination：40%
reports：40%

[Textbooks]

Ammon Yariv: Optical Electronics in Modern Communications, Oxford Series in Electrical and Computer Engineering, 2000 年(in English)
もしくは
Ammon Yariv, 多田 邦雄, 神谷 武志 (翻訳); 光エレクトロニクス 基礎編、丸善、2000 **年(**in Japanese**)**
Ammon Yariv, 多田 邦雄, 神谷 武志 (翻訳); 光エレクトロニクス 展開編、丸善、2000 **年(**in Japanese**)**.

[References]

[Schedule]

1. Introduction
2. Maxwell equations
3. Wave equation and propagation of the light
4. Propagation of light in free space
5. Propagation of light in optical fiber
6. Propagation of light in periodic structure
7. Electro-optic effect
8. Photorefractive effect
9. Holographic technology
10. Optical storage with holographic technology
11. Optical image processing with holographic technology
12. Optical sensing with plastic optical fiber
13. Introduction of advanced optical sensor
14. Introduction of advanced optical processing
15. Final examination

[Title]			[Instructor]		
Advanced Communication Systems			Masanori Hanawa		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417320	2	Information and Mechanical System Engineering	1st Semester	Mon.／II	English／Japanese

[Outline and purpose]

This lecture treats the advanced signal processing techniques used in modern high speed digital communication systems. Behavior of communication systems in the presence of noise, optimal signal detection theory, linear equalizers, various adaptive algorithms and adaptive equalizers, adaptive antennas may be discussed.

[Objectives]

1. Being able to explain the basic concept of the random variables and random processes
2. Being able to explain behavior of analog communication systems in the presence of noise
3. Being able to explain behavior of digital communication systems in the presence of noise
4. Being able to explain optimal signal detection theory
5. Being able to explain linear equalizers
6. Being able to explain the steepest decent algorithm
7. Being able to explain working principle of the LMS algorithm
8. Being able to explain working principle of the normalized LMS algorithm
9. Being able to explain working principle of the RLS algorithm

[Requirements]

Knowledge on Fourier analysis, linear signals and systems, basic theories on communication systems, fundamental digital signal processing techniques is required.

[Evaluation]

Oral interviews will be given several times during the semester

[Textbooks]

B. P. Lathi, Modern digital and analog communication systems 3rd Ed., Oxford University Press, 1998
Simon Haykin, Adaptive filter theory 4th Ed., Prentice Hall, 2002

[References]

Supplied arbitrarily when needed

[Schedule]

1. Random Variables, central limit theorem, correlation, linear mean square estimation
2. From random variables to random process, PSD of random processes, multiple random processes, transmission of random processes through linear systems, bandpass random processes, Wiener-Hopf filtering
3. Behavior of analog communication systems in the presence of noise
4. Behavior of digital communication systems in the presence of noise
5. Optimal signal detection
6. Lear equalizers
7. Steepest decent method
8. LMS algorithm
9. Normalized LMS algorithm
10. RLS algorithm
11. Related topics

[Title]			[Instructor]		
Advanced VLSI Circuit Engineering			Takahide Sato		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417330	2	Information and Mechanical System Engineering	2st Semester	Wed.／Ⅱ	English／Japanese

[Outline and purpose]

In these days, integrated circuits are widely used for various products, not only electronic devices such as a smart phone and a personal computer, but also automobile and consumer electronics applications. Integrated circuits are one of the most significant technologies supporting the sophisticated information society.
Engineers who understand the process technology of CMOS VLSI and can design integrated circuits are strongly desired. This lecture deals with the latest CMOS integrated circuits, circuit techniques, design examples, and so on.

[Objectives]

1. to understand basic of RF circuits.
2. to understand basic of a digital wireless communication systems.
3. to explain principle of Low noise amplifiers, Power amplifiers, mixers, voltage controlled oscillators, PLL, variable gain amplifiers, analog filters, ADC and DAC.

[Requirements]

Basic knowledge of electric circuit, electronic circuit and circuit theory

[Evaluation]

Report : 100%

[Textbooks]

Printed materials about lecture topics will be distributed during the lecture.

[References]

[Schedule]

1. RF circuit
2. Basic of digital wireless communication systems
3. Integrated circuits
4. MOS transistor and passive elements
5. Low noise amplifiers
6. Power amplifiers
7. Mixers
8. Voltage controlled oscillators
9. Phase lock loop
10. Voltage controlled amplifiers
11. Analog filters
12. Analog to digital convertors
13. Digital to analog convertors
14. Digital interfaces

[Title]			[Instructor]		
Advanced Signal Processing			Makoto Ohki		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417340	2	Information and Mechanical System Engineering	2nd Semester	Fri.／II	English／Japanese

[Outline and purpose]

This lecture treats topics of signal processing engineering, especially multi-dimensional signal processing and adaptive signal processing.

[Objectives]

1. to explain multi-dimensional signals
2. to explain multi-dimensional linear transforms such as the Fourier transform
3. to explain the multi-dimensional sampling theorem
4. to describe multi-dimensional systems using the transfer function or the state-space model
5. to explain how multi-dimensional filters work
6. to explain how fundamental multi-dimensional adaptive algorithms work

[Requirements]

fundamental knowledge of signal processing such as Fourier transform, Laplace transform, z-transform, the concept of filters

[Evaluation]

report: 100%

[Textbooks]

[References]

Woods, John W. : Multidimensional Signal, Image, and Video Processing and Coding (second edition), Academic Press, 2012.

[Schedule]

1. Multi-dimensional signals
2. Multi-dimensional Fourier transform
3. Multi-dimensional sampling theorem
4. Multi-dimensional Laplace transform and z-transform
5. Multi-dimensional systems
6. Multi-dimensional FIR filters
7. Multi-dimensional IIR filters
8. Multi-dimensional adaptive filters

[Title]			[Instructor]		
Lectures on Production Systems and Instrumentation Systems			Tsuyoshi Shimizu / Shigenobu Okazawa		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417490	2	Information and Mechanical Systems Engineering	1st Semester	Tue.／II	English／Japanese

[Outline and purpose]

Production systems have strong relationship to manufacturing techniques. The primary objective of this course is to provide an introduction to several of the topics to study. The recent topics of production systems and instrumentation systems are discussed.

[Objectives]

(1) to understand the recent interest in the production systems.
(2) to understand the recent interest in the instrumentation systems.

[Requirements]

Students must have basic knowledge of mechanical systems engineering.

[Evaluation]

1. Quizzes and reports 50%
2. Oral presentation and discussion 50%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Recent topic of Production systems
   2-1. Machining
   2-2. Mother machines
   2-3. Assembly & assembly tools
   2-4. Factory automation
   2-5. CAD,CAM,CAE
   2-6. Production & environment
   2-7. Student presentation I
3. Recent topic of Instrumentation systems
   3-1. Measurement tools
   3-2. Measurement systems
   3-3. Image processing systems
   3-4. Stochastic data processing
   3-5. Feed back to factory automation
   3-6. Uncertainty
   3-7. Student presentation II

[Title]			[Instructor]		
Advanced Thermo-Physical Engineering			Tetsuaki Takeda / Koji Toriyama/Shumpei Funatani		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417500	2	Information and Mechanical System Engineering	2nd Semester	Wed.／II	English／Japanese

[Outline and purpose]

It is a technologically important problem to increase the conversion efficiency of the thermal energy. Transport, storage, and conversion of the thermal energy are explained. In addition, effective utilization of thermal energy in the practical system is described.

[Objectives]

Generation, conversion, and use of the thermal energy can be understood.
The utilization efficiency of the thermal energy can be evaluated.

[Requirements]

Thermodynamics, Hydrodynamics, Thermal engineering, Fluid engineering, Numerical analysis

[Evaluation]

Report & examination : 60%
Presentation skill : 40%

[Textbooks]

Not specify

[References]

Not specify
Distribute research papers, if necessary

[Schedule]

1 Introduction
2-4 Production, storage, and transport of thermal energy
5 Evaluation of thermal energy system by theoretical approach and numerical analysis
6-8 Heat transport by thermal conduction, forced convection, natural convection, and thermal radiation
9-10 Conversion system of thermal energy and thermal efficiency
11-12 Renewable energy systems, such as solar thermal energy, wind energy, hydraulic energy, geothermal energy, etc.
13-14 Nuclear energy system and nuclear safety
15 Heat utilization systems such as thermoelectric conversion element, ground source heat pump system, etc.

[Title]			[Instructor]		
Turbulent Transport Engineering			Hiroyuki Tsunoda / Yoshinobu Yamamoto		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417510	2	Information and Mechanical System Engineering	2nd Semester	Mon.／III	English／Japanese

[Outline and purpose]

Many of practical flows appearing in the field of mechanical engineering are turbulent of high Reynolds numbers. Turbulent flow is known to have remarkably effective transport ability in comparison with laminar flow. In order to understand physical features of the turbulent flow, students will study the fluid-mechanical difference between laminar and turbulent flows, flow instability problems related with the turbulence transition and the statistical properties of turbulence. Then, the fundamental ideas how the turbulent flow is statistically described are discussed in the case of isotropic turbulence for which theoretical approaches have been completed as being most elementary and simplest turbulent flow. These statistical techniques for the isotropic turbulence can be applied to the analysis of more practical anisotropic turbulent shear flows such as pipe flow, boundary-layer flow or free shear flows. By investigating the momentum and thermal transport equations, students will learn experimental and numerical analysis methods for these flows.

[Objectives]

In the design and the development of various machines or apparatuses, there are many practical problems related with fluid engineering. This course aims to educate engineers who can manage these problems and moreover who have an ability to apply their knowledge to the creation of new technology. For this objective, students are expected to complete the following goals:

1. to understand the fundamental idea of turbulence
2. to understand the statistical methods for analyzing turbulent flows and to apply them to practical flows
3. to discuss turbulent flows based on the governing equations

[Requirements]

Overall knowledge on fluid engineering and fluid dynamics studied in the under-graduate and graduate courses, fundamental and applied knowledge on calculus, fundamental knowledge on vector calculus

[Evaluation]

homework：80%
presentation：20%

[Textbooks]

[References]

1. Davidson, P.A.: Turbulence: An Introduction for Scientists and Engineers, Oxford Univ. press, 2004, ISBN 0198529481
2. 日野幹雄 ： 流体力学, 朝倉書店, ISBN 4254200668 (in Japanese).
3. Tennekes, H. and Lumley, J.L. : A First Course in Turbulence, The MIT press, 1972, ISBN 0262200198.
4. Pope, S.B. : Turbulent Flows, Cambridge University Press, 2000, ISBN 0521598869.

[Schedule]

1. Introduction
2. Laminar and turbulent flows #1
3. Laminar and turbulent flows #2
4. Flux and turbulent transport
5. Isotropic turbulence #1
6. Isotropic turbulence #2
7. Reynolds equations
8. Turbulent shear flows
9. Turbulent flow in pipe
10. Boundary layer
11. Free shear flows
12. Several turbulence models and DNS
13. Measurement techniques of turbulent flows #1
14. Measurement techniques of turbulent flows #2
15. Summary

[Title]			[Instructor]		
Bio-Mechanics and Materials Engineering			Yoshihiro Nakayama / Yasumi Ito/Yasutake Haramiish		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417520	2	Information and Mechanical System Engineering	1st Semester	Fri.／I	Japanese

[Outline and purpose]

1. In the first half of the period, a lecture is carried out about biomechanics, medical engineering, welfare engineering and various kinds of biomedical measurement methods.
2. In the latter half of the period, a lecture is carried out about industrial materials. The innovative and highest production technology will be lectured together with a recycling technology.

[Objectives]

1. to bring up the mechanical engineer who is able to do the applied research on biomechanics and medical engineering.
2. to bring up the mechanical engineer who is able to choose the structural materials based on scientific knowledge through the learning of the advanced and innovative technique.

[Requirements]

Students must have basic knowledge about mechanics of materials, and materials engineering.

[Evaluation]

1. Reports：80%
2. Oral presentation and discussion：20%

[Textbooks]

The document will be distributed appropriately.

[References]

Reference books will be announced during a lecture as needed.

[Schedule]

1. Foundations of biomechanics and medical engineering
2. Mechanics of bone
3. Arthrosis, cartilage, ligament
4. Ultrasonic diagnostic device, X-ray diagnosis device, nuclear magnetic resonance images
5. Endoscope
6. Artificial heart, heart pace maker
7. Rehabilitation device, welfare device
8. Foundations of industrial and engineering materials
9. Steel
10. Copper alloys
11. Titanium alloys
12. Aluminum alloys
13. Magnesium alloys
14. Present state and future of recycle technology in metallic materials
15. Summary

[Title]			[Instructor]		
Advanced Plasticity Engineering			Shoichiro Yoshihara		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417521	2	Information and Mechanical System Engineerin	2nd Semester	Wed.／III	English／Japanese

[Outline and purpose]

It is imperative to study plasticity forming in manufacturing for automotive components and several devises. Furthermore, we have to control stress and strain in order to avoid fracture and wrinkle during processes by new technology. In this class, the new technology from new published paper would be surveyed and learned for looking toward the future.

[Objectives]

Stress and strain Conditions of material should be understood. Moreover, fracture and wrinkle of material during processes could be evaluated by several references in the area of plasticity forming.

[Requirements]

Strength of Materials, Press Forming, Material Engineering

[Evaluation]

Report & examination : 60%
Presentation skill : 40%

[Textbooks]

Not specify

[References]

Not specify

[Schedule]

1-3:Plasticuty Mechanics
  Relationship between stress and strain
  Yield Stress(von Mises and Tresca Yield criterion)
4-6:Press forming
  Sheet metal forming
  Forging
  Bulge forming
  Bending
7-9:Incremental forming
  Sheet metal
  Tube material
10-12:Tube forming
  Tubehydro forming
  Tube bending
13-15:Simulation Technology

[Title]			[Instructor]		
Advanced Theory of Vibration Control			Atsushi Fujimori / Yoshiyuki Noda		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417530	2	Information and Mechanical System Engineering	2nd Semester	Fri.／II	Japanese

[Outline and purpose]

Active vibration control techniques, for example, H infinity control, μ analysis and design and gain scheduling control, are introduced in the former part of this lecture. Some of them are given in MATLAB. In the latter part, analysis techniques of vibration characteristics using Fourier transform and Time-Frequency analysis are introduced.

[Objectives]

1. To learn active vibration control design technique using MATLAB.
2. To learn analysis of vibration characteristics using MATLAB.

[Requirements]

System control theories and robust control should be learnt for taking this class.

[Evaluation]

Report I: 50%
Report II: 50%

[Textbooks]

Atsushi Fujimori: *Robust Control*, Corona Publishing, Tokyo, 2001 (in Japanese)

[References]

K. Kogoh and T. Mita: *Introduction to System Control Theory*, Jikkyo Publishing, Tokyo, 1979 (in Japanese).
D. Newland: An Introduction to Random Vibrations, Spectral & Wavelet Analysis, Longman, 1993

[Schedule]

1. Introduction
2. Review of linear system control theory
3. Review of robust control
4. H infinity control
5. μ analysis and design
6. Gain scheduling control
7. Active vibration control I
8. Active vibration control II
9. Review of Fourier transform
10. Analysis of vibration characteristics in frequency domain
11. Identification of vibration characteristics
12. Introduction of vibration systems with time varying characteristics
13. Vibration analysis by Time-Frequency analysis I
14. Vibration analysis by Time-Frequency analysis II
15. Vibration suppression control based on Time-Frequency analysis

[Title]			[Instructor]		
Advanced Space Systems Engineering			Junichiro Aoyagi		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417531	2	Information and Mechanical System Engineering	1st Semester	Mon.／II	Japanese

[Outline and purpose]

Spacecraft is one of the most complicated systems. Its design requires comprehensive technique and integration skill. This lecture learns components of a spacecraft, and space propulsion system. Mission design will be also studied.

[Objectives]

The following subjects should be well understood:
* Design concept of a spacecraft and its mission,
* Spacecraft subsystems and its required specification,
* Principle of space propulsion and orbit transfer.

[Requirements]

Knowledge of dynamics, mathematics and comprehensive mechanical engineering

[Evaluation]

Repot30%
Presentation70%

[Textbooks]

Ronald W. Humble, Gary N. Henry, Wiley John Larson, Spacecraft Systems Engineering, McGraw-Hill, 0070313202
George P. Sutton, Oscar Biblarz, Rocket Propulsion Elements, AIAA, 1563475243

[References]

Peter Fortescue, Graham Swinerd and John Stark, Spacecraft Systems Engineering, Wiley, 9780470750124
George P. Sutton, Oscar Biblarz, Rocket Propulsion Elements, Wiley, 0470080248

[Schedule]

1. Introduction: Space environment, Rocket, and Spacecraft
2. Rocket Fundamentals and Design Process
3. Mission Analysis
4. Spacecraft Components
5. Structures
6. Thermal Control
7. Power System
8. Attitude Control
9. Telecommunication, Command and Data System
10. Propulsion #1 Chemical Propulsion
11. Propulsion #2 Electric Propulsion
12. Propulsion #3 Advanced Propulsion
13. Mission Design Case Study
14. Research of State-of-the-Art Space Mission
15. Conclusion

[Title]			[Instructor]		
Advanced Wave Application Engineering			Takaaki Ishii / Toshiya Kitamura		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417710	2	Information and Mechanical System Engineering	2nd Semester	Wed.／IV	English / Japanese

[Outline and purpose]

Wave is basic physical phenomenon. A lot of applications are widely used in our society and understanding wave technology is very important. Deep and thorough understanding of the fundamentals and applications of wave is greatly expected in this course.

[Objectives]

1. to understand the fundamentals and applications of the wave

[Requirements]

Fundamental knowledge of the acoustics, physics, mathematics, chemistry, materials, mechanical engineering, electrics and electronic engineering, etc.

[Evaluation]

Report：80%
Attendance：20%

[Textbooks]

None

[References]

1. 山田伸志, 黒崎茂, 小坂敏文, 松村志真秀, 吉村靖夫, 渡辺敏夫：振動工学入門, パワー社 2001 年 (in Japanese)
2. Kenji Uchino：Ferroelectric devices, Marcel Dekker (2000)
3. Kenji Uchino, Jayne Giniewicz：Micromechatronics, Marcel Dekker (2003)
4. 城戸健一：ディジタルフーリエ解析(II), コロナ社 2007 年 (in Japanese)

[Schedule]

1. Fundamentals and applications of ferroelectrics
2. Fundamentals and applications of ultrasonics
3. Fundamentals and applications of the acoustics
4. Measurements and applications of the analysis technology

[Title]			[Instructor]		
Advanced Photon Engineering			Tetsuo Harimoto / Lianhua Jin		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417720	2	Information and Mechanical System Engineering	1st Semester	Mon.／IV	Japanese

[Outline and purpose]

Emphases of this course are on the development of ultrahigh intensity laser science and interaction of laser and materials. In addition, some numerical methods on the photon engineering, especially involving the UV laser generation using the second-harmonic generation and the optical chirped pulse parametric amplification. It meets the needs of many students with interests in the modern physics and provides students with a general feel for the subject of ultrahigh intensity laser science.

[Objectives]

To introduce students to the concept of photon and ultrahigh intensity laser science.
To introduce students to the generation mechanism of ultrashort laser pulses.
To allow students to learn the numerical method of the photon engineering.
To introduce students to the interaction of laser and materials.

[Requirements]

Electromagnetics, optics, and quantum mechanics.

[Evaluation]

Report: 80%
Attendance: 20%

[Textbooks]

[References]

Amnon Yariv, Optical Electronics, Saunders College Publishing, 1991, ISBN:0030474442
Amnon Yariv, Quantum Electronics, John Wiley & Sons Inc., 1989, ISBN:0471609978

[Schedule]

1. Generation of ultrashort and ultrahigh intensity laser pulses
2. Wavelength conversion of ultrahigh intensity laser pulses
3. Amplification of a cycle pulse
4. Measurement for ultra-broadband laser pulses
5. Design of photonics devices
6. Interaction of laser and materials
7. Simulation of photon engineering

[Title]			[Instructor]		
Instrumentation Applied Physics			Katsuyoshi Watanabe		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417740	2	Information and Mechanical System Engineering	1st Semester	Fri.／I	Japanese

[Outline and purpose]

Extreme measurements are often necessary to develop advanced technologies. Here extreme measurements mean to measure size of the nanoscale, extremely small current, femtosecond phenomena, for example. This lecture is intended to provide physical basis of those measurements.

[Objectives]

The objective is to understand physical basis of technologies in the schedule.

[Requirements]

It is advisable to know basics of dynamics, electromagnetism, quantum mechanics, laboratory experiments of physics and mechanical engineering.

[Evaluation]

1. Reports at the end of a semester (80%)
2. Usual exercises (20%)

[Textbooks]

We will suggest suitable articles.

[References]

We will suggest suitable articles.

[Schedule]

1. The principle of electron microscopy Condensation of atoms and molecules
2. Fabrication of thin films
3. Fabrication of semiconductor hetero structures
4. Determination of crystal structures by X-ray diffraction measurements
5. Transmission Electron Microscope
6. Scanning Tunneling Microscope
7. In situ monitoring of the growth of thin films
8. Atomic force microscopy
9. Interactions of photons with matter (1)
10. Interactions of photons with matter (2)
11. Emission devices
12. Optical spectroscopy techniques (1)
13. Optical spectroscopy techniques (2)
14. Ultrafast phenomena in spectroscopy
15. Summary

[Title]			[Instructor]		
Advanced Mechatronics			Nobuyuki Furuya / Hidetsugu Terada		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417760	2	Information and Mechanical Systems Engineering	1st Semester	Wed.／II	Japanese

[Outline and purpose]

Learning about the mechanism and control of robots by the latest robotics papers, then the design method of robots will be discussed.

[Objectives]

(1) to understand the structure of robot mechanism and be able to design various robots.
(2) to understand professional item of robot control technology.
(3) to understand the latest trends in robotics research

[Requirements]

Grounding in calculus, algebra, knowledge of kinematics, dynamics, mechanical design and material, assuming knowledge of robotics. Also and in some cases, the materials are written in English.

[Evaluation]

1. Small test and Presentation 80%
2. Routine test and Report 20%

[Textbooks]

Textbook is not used. Materials will be provided.

[References]

1. Control system design, McGRAW-HILL, ISBN:0486442780
2. SIGNALS AND LINEAR SYSTEMS,Jhon Wiley & Sons,ISBN:0471838217
3. 現代制御理論入門, コロナ社, ISBN:4339031615 (In Japanese)
4. Mark E. Rosheim, Robot Evolution -The Development of Authrobotics-, John Wiley & Sons, Inc., ISBN:0471026220

[Schedule]

Do a lecture on the content of the following from the perspective of designing a robot.

１. Mechanism of the robot (1-5 times)

To discuss about the forward kinematics and the inverse kinematics solution and the derivation techniques of three-dimensional mechanism with the singular points analysis of serial and parallel robots, focusing on the differences in particular.

２. Robot control (6 to 10)

To discuss about the control algorithm of Point to Point and Continuous path control, explaining about the practical path control and interpolation method. Communication systems and servo mechanism with the examples be explained.

３. Intelligent Robots (11 times to 15 times)

To discuss how intelligent robot will be constructed using smart sensor system, and be explained a variety of image recognition techniques and algorithms in robot.

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering I			Each Professor		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417900 A	2	Information and Mechanical System Engineering(system solution)		Thu.／I	Japanese

[Outline and purpose]

Making technical decisions is a necessary part of planning and design of solution systems by applying engineering techniques. The elements of the decision model and the analyses involved in a decision problem are developed in this course.

[Objectives]

1. to understand the decision method and its application
2. to solve the engineering decision problems by the decision method

[Requirements]

a basic knowledge on Information and Mechanical System Engineering, especially system solutions

[Evaluation]

homework : 20%
midterm examination : 40%
final examination : 40%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Decision method: theory 1
3. Decision method: theory 2
4. Decision method: theory 3
5. Decision method: application 1
6. Decision method: application 2
7. Decision method: application 3
8. Decision method: application 3
9. Midterm examination
10. Decision method in real world 1
11. Decision method in real world 2
12. Decision method in real world 3
13. Decision method in real world :Practice 1
14. Decision method in real world :Practice 2
15. Final examination

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering I			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417900 C	2	Information and Mechanical System Engineering Dept. of Mechanical Design System		Fri.／III	English／Japanese

[Outline and purpose]

This is a lecture-style class by the graduate advisor directing your research work. In order to acquire extensive technical knowledge, assignments is not necessarily directly related to the details of your research work.

[Objectives]

To acquire technical knowledge through literatures and discussion.

[Requirements]

Fundamental knowledge related to your research.

[Evaluation]

Comprehensive evaluation from progress of the problem solution, reports and an answer to a question : 100%

[Textbooks]

[References]

[Schedule]

The lectures by an instructor on the specific assignments.

Student chooses a vice-graduate advisor besides the chief-advisor, and can ask for advice about presentation skills and plan of the research work.

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering I			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417900 D	2	Information and Mechanical Systems Engineering		Fri.／III	Japanese

[Outline and purpose]

At this lecture, mechanical engineering and information engineering will be taught.

[Objectives]

We are aimed at acquiring practical knowledge as an engineer deserving to be a person of Ph.D. program completion.

[Requirements]

The fundamental knowledge of calculus, algebra, kinematics, machine elements design and mechanics of materials are needed. Also, you need English to read the reference papers.

[Evaluation]

Several Reports：100%

[Textbooks]

We will distribute reference papers if necessary.

[References]

None.

[Schedule]

A theme is chosen among a thing related to a specialized field of each adviser.

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering I			Each Professor		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417900 E	2	Information and Mechanical System Engineering(system solution)		Thu.／I	Japanese

[Outline and purpose]

Making technical decisions is a necessary part of planning and design of solution systems by applying engineering techniques. The elements of the decision model and the analyses involved in a decision problem are developed in this course.

[Objectives]

1. to understand the decision method and its application
2. to solve the engineering decision problems by the decision method

[Requirements]

a basic knowledge on Information and Mechanical System Engineering, especially system solutions

[Evaluation]

homework：20%
midterm examination：40%
final examination：40%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Decision method: theory 1
3. Decision method: theory 2
4. Decision method: theory 3
5. Decision method: application 1
6. Decision method: application 2
7. Decision method: application 3
8. Decision method: application 3
9. Midterm examination
10. Decision method in real world 1
11. Decision method in real world 2
12. Decision method in real world 3
13. Decision method in real world :Practice 1
14. Decision method in real world :Practice 2
15. Final examination

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering I			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417900 G	2	Information and Mechanical System Engineering Dept. of Mechanical Design System		Fri.／III	English／Japanese

[Outline and purpose]

This is a lecture-style class by the graduate advisor directing your research work. In order to acquire extensive technical knowledge, assignments is not necessarily directly related to the details of your research work.

[Objectives]

To acquire technical knowledge through literatures and discussion.

[Requirements]

Fundamental knowledge related to your research.

[Evaluation]

Comprehensive evaluation from progress of the problem solution, reports and an answer to a question : 100%

[Textbooks]

[References]

[Schedule]

The lectures by an instructor on the specific assignments.

Student chooses a vice-graduate advisor besides the chief-advisor, and can ask for advice about presentation skills and plan of the research work.

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering I			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417900 H	2	Information and Mechanical Systems Engineering		Fri.／III	Japanese

[Outline and purpose]

At this lecture, mechanical engineering and information engineering will be taught.

[Objectives]

We are aimed at acquiring practical knowledge as an engineer deserving to be a person of Ph.D. program completion.

[Requirements]

The fundamental knowledge of calculus, algebra, kinematics, machine elements design and mechanics of materials are needed. Also, you need English to read the reference papers.

[Evaluation]

Several Reports：100%

[Textbooks]

We will distribute reference papers if necessary.

[References]

None.

[Schedule]

A theme is chosen among a thing related to a specialized field of each adviser.

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering II			Each Professor		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417910 A	2	Information and Mechanical System Engineering(system solution)		Tue.／I	Japanese

[Outline and purpose]

Making technical decisions is a necessary part of planning and design of solution systems by applying engineering techniques. The elements of the decision model and the analyses involved in a decision problem are developed in this course.

[Objectives]

1. to understand the decision method and its application
2. to solve the engineering decision problems by the decision method

[Requirements]

a basic knowledge on Information and Mechanical System Engineering, especially system solutions

[Evaluation]

homework：20%
midterm examination：40%
final examination：40%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Decision method: theory 1
3. Decision method: theory 2
4. Decision method: theory 3
5. Decision method: application 1
6. Decision method: application 2
7. Decision method: application 3
8. Decision method: application 3
9. Midterm examination
10. Decision method in real world 1
11. Decision method in real world 2
12. Decision method in real world 3
13. Decision method in real world :Practice 1
14. Decision method in real world :Practice 2
15. Final examination

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering II			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417910 C	2	Information and Mechanical System Engineering Dept. of Mechanical Design System		Fri.／IV	English／Japanese

[Outline and purpose]

This is a lecture-style class by the graduate advisor directing your research work. In order to acquire extensive technical knowledge, assignments is not necessarily directly related to the details of your research work.

[Objectives]

To acquire technical knowledge through literatures and discussion.

[Requirements]

Fundamental knowledge related to your research.

[Evaluation]

Comprehensive evaluation from progress of the problem solution, reports and an answer to a question : 100%

[Textbooks]

[References]

[Schedule]

The lectures by an instructor on the specific assignments.

Student chooses a vice-graduate advisor besides the chief-advisor, and can ask for advice about presentation skills and plan of the research work.

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering II			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417910 D	2	Information and Mechanical Systems Engineering		Fri.／IV	Japanese

[Outline and purpose]

As follow the Special Practice I, at this lecture, mechanical engineering and information engineering will be taught.

[Objectives]

We are aimed at acquiring practical knowledge as an engineer deserving to be a person of Ph.D. program completion.

[Requirements]

The fundamental knowledge of calculus, algebra, kinematics, machine elements design and mechanics of materials are needed. Also, you need English to read the reference papers.

[Evaluation]

Several Reports：100%

[Textbooks]

We will distribute reference papers if necessary.

[References]

None.

[Schedule]

A theme is chosen among a thing related to a specialized field of each adviser.

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering II			Each Professor		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417910 E	2	Information and Mechanical System Engineering(system solution)		Tue.／I	Japanese

[Outline and purpose]

Making technical decisions is a necessary part of planning and design of solution systems by applying engineering techniques. The elements of the decision model and the analyses involved in a decision problem are developed in this course.

[Objectives]

1. to understand the decision method and its application
2. to solve the engineering decision problems by the decision method

[Requirements]

a basic knowledge on Information and Mechanical System Engineering, especially system solutions

[Evaluation]

homework：20%
midterm examination：40%
final examination：40%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Decision method: theory 1
3. Decision method: theory 2
4. Decision method: theory 3
5. Decision method: application 1
6. Decision method: application 2
7. Decision method: application 3
8. Decision method: application 3
9. Midterm examination
10. Decision method in real world 1
11. Decision method in real world 2
12. Decision method in real world 3
13. Decision method in real world :Practice 1
14. Decision method in real world :Practice 2
15. Final examination

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering II			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417910 G	2	Information and Mechanical System Engineering Dept. of Mechanical Design System		Fri.／IV	English／Japanese

[Outline and purpose]

This is a lecture-style class by the graduate advisor directing your research work. In order to acquire extensive technical knowledge, assignments is not necessarily directly related to the details of your research work.

[Objectives]

To acquire technical knowledge through literatures and discussion.

[Requirements]

Fundamental knowledge related to your research.

[Evaluation]

Comprehensive evaluation from progress of the problem solution, reports and an answer to a question : 100%

[Textbooks]

[References]

[Schedule]

The lectures by an instructor on the specific assignments.

Student chooses a vice-graduate advisor besides the chief-advisor, and can ask for advice about presentation skills and plan of the research work.

[Title]			[Instructor]		
Advanced Exercises for Information and Mechanical Systems Engineering II			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417910 H	2	Information and Mechanical Systems Engineering		Fri.／IV	Japanese

[Outline and purpose]

As follow the Special Practice I, at this lecture, mechanical engineering and information engineering will be taught.

[Objectives]

We are aimed at acquiring practical knowledge as an engineer deserving to be a person of Ph.D. program completion.

[Requirements]

The fundamental knowledge of calculus, algebra, kinematics, machine elements design and mechanics of materials are needed. Also, you need English to read the reference papers.

[Evaluation]

Several Reports：100%

[Textbooks]

We will distribute reference papers if necessary.

[References]

None.

[Schedule]

A theme is chosen among a thing related to a specialized field of each adviser.

[Title]			[Instructor]		
Field Research of Information and Mechanical Systems Engineering			Each Professor		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417920 A	2	Information and Mechanical System Engineering(system solution)			Japanese

[Outline and purpose]

Making technical decisions is quite important for planning and design of solution systems in a real world. The elements of the decision model and the process are developed in this course.

[Objectives]

1. to understand the decision method in a real world
2. to make practice of the decision in areal world

[Requirements]

a basic knowledge on Information and Mechanical System Engineering, especially system solutions

[Evaluation]

homework : 20%
midterm examination : 40%
final examination : 40%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Decision method: theory 1
3. Decision method: theory 2
4. Decision method: theory 3
5. Decision method: application 1
6. Decision method: application 2
7. Decision method: application 3
8. Decision method: application 3
9. Midterm examination
10. Decision method in real world 1
11. Decision method in real world 2
12. Decision method in real world 3
13. Decision method in real world :Practice 1
14. Decision method in real world :Practice 2
15. Final examination

[Title]			[Instructor]		
Field Research of Information and Mechanical Systems Engineering			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417920 C	2	Information and Mechanical System Engineering Dept. of Mechanical Design System		／	Japanese

[Outline and purpose]

The purpose of field research is to gain a better understanding of the knowledge that the student has acquired at this graduate school through the training of specialized skills in public offices and private companies.

[Objectives]

1. To conduct field research for more than two weeks.
2. To understand how knowledge learned in the course is useful in society.
3. To enhance your motivation of learning of specialized education and help your career after completion of the course.

[Requirements]

Having fundamental knowledge on the field of study, common sense and proper mental attitude as a member of the university.

[Evaluation]

Others(Training period, the evaluation from the internship host, internship report and presentation and so on): 100%

[Textbooks]

[References]

[Schedule]

1. Application process

There are two types of field research program: the program recommended by an academic supervisor and the program provided by the internship host.

- The program recommended by an academic supervisor

Students should arrange an internship host and project with their academic supervisor. Then, they should communicate name of company and proposed period to the internship instructor. The internship instructor will apply for the host in cooperation with their academic supervisor.

- The program provided by the internship host

Students should collect the information about field research programs from the guidance of internship and the career center homepage and find a field research program in consultation with their academic supervisor. Then, they should apply to the educational affairs section.

2. During the field research program

Students should do their field research under the host.

3. Report and presentation

We will explain about the field research report and presentation in detail at the time of the guidance.

[Title]			[Instructor]		
Field Research of Information and Mechanical Systems Engineering			Each academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
417920 D	2	Information and Mechanical Systems Engineering	-	-	Japanese

[Outline and purpose]

The research and development in cooperation with non-member organizations, such as a company or a government office, will be participated.

[Objectives]

We are aimed at acquiring practical knowledge as an engineer deserving to be a person of Ph.D. program completion.

[Requirements]

The fundamental knowledge of calculus, algebra, kinematics, machine elements design and mechanics of materials are needed. Also, you need English to read the reference papers.

[Evaluation]

Several Reports and presentations: 100% with 60hours researches.

[Textbooks]

We will distribute reference papers if necessary.

[References]

None.

[Schedule]

A theme is chosen among a thing related to a specialized field of each adviser.