(2006)

Graduate Course Information

Graduate School of Advanced Technology and Science
The University of Tokushima

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Chapter 1

MASTER’s DEGREE

Intelligent Structures and Mechanics Systems Engineering

Intelligent Structures and Mechanics Systems Engineering — Civil and Environmental Engineering
Syllabus of subjects

List of Subjects

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125105/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125106/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Management of Technology

Associate Professor · Tatsuya Deguchi (2 units)

Target〉 About the production management of the automobile industry, it is understood variously from the point of view such as ”research and development”, ”production management”, ”purchasing” and ”quality control” ”marketing” and ”cross-cultural management”.

Outline〉 It learns about the production management. This time, ”the automobile industry” specially takes up the production management of ”Honda Motor Co.,Ltd. (following Honda)” even of that in the case, and the class to appreciate that importance with ranking of technology in management is taken.

Requirement〉 Finish ” Introduction to new business ” or ” Advanced Lecture in management Theory of new business ” .

Notice〉 Face a class when a taking lecture person surely does enough preparation every time. And moreover, be the worst, but one person one time is to do some remarks every time.

Goal〉

1. The elementary knowledge of management is learned.
2. Ranking of the technology in management and that importance are appreciated.
3. It learns how to solve the various problems which always occur in the spot of the management through the case study and the business game.

Schedule〉

1. Guidance
2. Lecture ”What in Management of Technology?”
3. Case report ”Rsearch and development of Honda”
4. Case study ”Plan an overseas factory.” ”A new car development order”
5. Lecture ” Production management and purchasing”
6. Lecture ”Quality control”
7. Case report ”The production management of Honda”,”The supply chain management of Honda”
8. Case study ”Plan an overseas factory.”
9. Case report ”The quality control of Honda”
10. Case study ”Don't make material defects flare up again.”
11. Lecture ”Marketing strategy”
12. Lecture ”Cross-cultural management”
13. Case report ”Around the products project of Honda - the two-wheeled vehicle ”
14. Case report ”The path of internationalization of Honda”
15. Case report ”The personnel management of Honda”
16. Summary and questions and answers

Evaluation Criteria〉 It is evaluated in the remark (20%) in class and the middle, end of a term report (80% in total).

Textbook〉 It doesn't specially use.The summary and so on is distributed every time.

Reference〉 Several are introduced in class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125107/

Student〉 The person who finished ”Introduction to new business” or ” Advanced Lecture in management Theory of new business “ in all the students enrolled in the doctor former term course. And, the number of taking lecture people is restricted to do intensive learning. (20-25 people will be made an upper limit.) It is selected with some means in case of a taking lecture person many.

Note〉 This class invites seven Honda alumnuni who did work in ”research and development”, ”production management”, ”purchasing”, ”quality control”, ”marketing” , ”cross-culutural management”, and so on as an instructor, and it is the class to do case report. Even if it is seen nationwide, the trial done like this is very rare, and it is a precious class. And, an applicant for taking lecture is to attend it in the guidance to hold it in advance.A schedule is indicated separately.

Presentation Method (M)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125108/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (M)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal.
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125109/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (M)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125110/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Applied Fluid Dynamics

Professor · Takeshi Okabe, Kunihiko Ishihara (2 units)

Target〉 This subject is concerned with flood flow, sediment transport and riverbed variation. The aim of this subject is to understand fundamentals of those phenomena as well as numerical solution methods for the basic equations.

Outline〉 First, characteristics of flood flow, sediment transport and riverbed variation are interpreted and the basic equations of those phenomena are deduced and presented. Next, fundamentals of numerical solution methods for partial differential equations are lectured to be put into practical usage for numerical simulation of various kinds of flood flow and riverbed variation. Finally, some simple problems are given to practice computer programming by FORTRAN.

Style〉 Lecture and excercise

Keyword〉 flood flow, sediment transport, riverbed variation, numerical model

Relational Lecture〉 "Advanced Disaster Reduction Engineering"(0.7, ⇒24 page), "Advanced Water Resouces Engineering"(0.7, ⇒23 page)

Requirement〉 Fundamental knowlege of hydraulics, river engineering and numerical analysis is necessary.

Notice〉 not specified.

Goal〉 fundamentals of flood flow, sediment transport and riverbed variation are understood and numerical techniques for those problems are aquired at practical level.

Schedule〉

1. guidance (river problems and numerical analysis)
2. basic equations of river flow
3. critical condition of sediment motion
4. formulas of bed load
5. formulas of susupended load
6. basic equations of riverbed variation
7. test(1)
8. outline of numerical solution of differential equations
9. numerical models for river flow (1)
10. numerical models for river flow (2)
11. numerical models for riverbed variation (1)
12. numerical models for riverbed variation (2)
13. problem setting and orientation for programming
14. practice of programing (1)
15. practice of programing (2)
16. test(2), presentation

Evaluation Criteria〉 marks of tests (1) and (2) are summed with the weights of 6 and 4, respectively, and the passing mark is 60%.

Textbook〉 Japan Sabo-Gakkai, Numerical solution of riverbed variation in mountain rivers, Sankaido Publ..

Reference〉 not specified.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125111/

Student〉 Able to be taken by only specified class(es)

Contact〉 Okabe (A309, +81-88-656-7329, okabetak@ce.tokushima-u.ac.jp)

Advanced Structural Dynamics

Associate Professor · Fumiaki Nagao (2 units)

Target〉 To understand the dynamic response and control of structures

Outline〉 In the first half of the semester, following the 'Introduction on Structural Dynamics' learned in under graduate course, methodologies to construct the physical and mathematical models of structural oscillations are reviewed and meanings of their mathematical solutions are examined again in physical standpoint. In the latter half, random vibration theories based on the statistics and probability and passive and active structural oscillation control are introduced. For the purpose to deepen the understanding, many exercises are prepared.

Keyword〉 Analysis of Dynamic Response, Analysis of Random Vibrations, Control of Dynamic Response

Fundamental Lecture〉 "Stractural Dynamics and Exercise"(1.0)

Relational Lecture〉 "Advanced Structural Design"(0.5, ⇒34 page)

Goal〉 To understand the dynamic response and control of structures

Schedule〉

1. Formation of Equations of Motion 1
2. Formation of Equations of Motion 2
3. Analysis of Dynamic Response 1
4. Analysis of Dynamic Response 2
5. Analysis of Dynamic Response 3
6. Analysis of Dynamic Response 4
7. Analysis of Random Vibrations 1
8. Analysis of Random Vibrations 2
9. Analysis of Random Vibrations 3
10. Analysis of Random Vibrations 4
11. Analysis of Random Vibrations 5
12. Control of Dynamic Response 1
13. Control of Dynamic Response 2
14. Control of Dynamic Response 3
15. Control of Dynamic Response 4

Evaluation Criteria〉 evaluated by attitude in class (80%) and reports (20%)

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125112/

Contact〉 Nagao (A515, +81-88-656-9443, fumi@ce.tokushima-u.ac.jp)

Advanced Fracture and Structural Mechanics

Associate Professor · Yoshifumi Nariyuki, *Professor* · Ri-ichi Murakami, *Associate Professor* · Teruaki Ito (2 units)

Target〉 To understand method of matrix displacement analysis of plane framed structures which is widely used as a suitable method for computer programming.

Outline〉 First, method of matrix displacement analysis of plane framed structurs is explained. Next, some problems are given for exercises in analysis of them. Finally, term examination is set. This class is a seminar type using textbook written in English.

Style〉 Lecture

Keyword〉 Framed structure, Matrix displacement method, Plane frame, Elastic analysis

Relational Lecture〉 "Advanced building construction"(0.5, ⇒37 page), "Advanced Civil and Environmental Engineering Seminar"(0.5, ⇒41 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level structure mechanics.

Notice〉 Students have to prepare for each lesson.

Goal〉 To understand method of matrix displacement analysis of plane frames

Schedule〉

1. Guidance/A few historical remarks
2. Basic considerations of structural analysis 1
3. Basic considerations of structural analysis 2
4. Determinate and indeterminate structures/Methods of analysis 1
5. Methods of analysis 2
6. Displacement method
7. Stiffness matrix of a bar element subjected to axial force
8. Bar structure stiffness matrix
9. Application of zero-displacement boundary conditions and problem solution
10. Some properties of stiffness matrices/Stiffness matrix of a bar element subjected to torsion
11. Stiffness matrix of a beam element 1
12. Stiffness matrix of a beam element 2
13. Assembly of the structure stiffness matrix by the direct stiffness method 1
14. Assembly of the structure stiffness matrix by the direct stiffness method 1
15. Symmetrical geometry
16. Term examination

Evaluation Criteria〉 Term examination and report are marked out of 60 and 40 respectively and those marks are summed up. The passing mark is 60.

Textbook〉 Matrix and finite element displacement analysis of structures, D.J.DAWE, Clarendon press, Oxford, 1984

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125113/

Student〉 Able to be taken by only specified class(es)

Contact〉 Nariyuki (A510, +81-88-656-7326, nariyuki@ce.tokushima-u.ac.jp)

Advanced Properties of Material

Professor · Hiroyuki Mizuguchi (2 units)

Target〉 Understanding on the relationship between micro-structures and macro-properies of conatruction materials paticularly concrete and some of construction materials in a concept of sustainable materials cycling society.

Outline〉 It is necessary undersatanding a proper material for a construction method to satisfy the required performances in each civil work. For this reason, it is very important to understand the relationship between micro-structures and macro-mechanical and chemical properties of consteruction material particularly concrete. And, it is introduced a concept on construction material in sustainable material cycling society.

Style〉 Lecture

Keyword〉 Construction Material, Concrete, Susatinable Cycling Society

Relational Lecture〉 "Advanced reinforced concrete engineering"(0.5, ⇒31 page)

Requirement〉 No requirement.

Goal〉

1. Understanding on the relationship between micro-structures and macro-properties of construction materials particularly concrete.
2. Understanding on a concept of construction materials in sustainable cycyling society.

Schedule〉

1. Guidance on lecture
2. Admixture(No.1)
3. Admixture(No.2)
4. Fresh Concrete(No.1)
5. Fresh Concrete(No.2)
6. Fresh Concrete(No.3)
7. Highly Fluidized Concrete(No.1)
8. Highly Fluidized Concrete(No.2)
9. Mass Concrete(No.1)
10. Mass Concrete(No.2)
11. Eco-Concrete(No.1)
12. Eco-Concrete(No.2)
13. Concept of Construction Material in Sustainable Material Cycling Society(No.1)
14. Concept of Construction Material in Sustainable Material Cycling Society(No.2)
15. Concept of Construction Material in Sustainable Material Cycling Society(No.3)
16. Comments for Reports on Concrete

Evaluation Criteria〉 Evaluate by reports for each subject.

Textbook〉 Handout of photo copying materals for each subject

Reference〉

- ◇ Standard Specificatiin for Concrete JACE.
- ◇ Handbook on Concrete,Asakura Book Co Ltd.
- ◇ Etc.

Webpage〉 http:///www.ce.tokushima-u.ac.jp/ksys/mizuguchi.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125114/

Student〉 Able to be taken by student of other faculty and university

Contact〉 Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Project Management

Assistant Professor · Susumu Namerikawa (2 units)

Target〉 The purpose of this lecture is to understand PMBOK (Project Management Body of Knowledge), which is global standard in project management.

Outline〉 This lecture is outlined as follows: A)Current of global standardize pivoted on U.S. in project management. B)PMBOK (Project Management Body of Knowledge), which is global standard in project management.

Style〉 Lecture

Keyword〉 PMBOK

Fundamental Lecture〉 "Construction Business Management"(0.2)

Goal〉 Understanding of project management body of knowledge

Schedule〉

1. Guidance
2. Project and Project Management
3. Initiating Processes
4. Project Charter
5. Scope and WBS
6. Resource Planning and Estimate
7. Control of Project Planning 1
8. Control of Project Planning 2
9. Develop Project Planning 1
10. Develop Project Planning 2
11. Develop Project Team
12. Performance Measurement Baseline
13. Change Control
14. Closing Processes
15. Professional Responsibility
16. Semester Examination

Evaluation Criteria〉 Achievement level of the target is evaluated by the semester examination. Score of 60points or over is required to clear the target.

Textbook〉 Textbook is ibtroduced in the class. Realted documents is distributed to students.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125133/

Student〉 Able to be taken by student of other department

Contact〉 Namerikawa (A412, +81-88-656-9877, namerikawa@ce.tokushima-u.ac.jp)

Quantum mechanics and advanced lecture in quantum physics

Associate Professor · Yoshitaka Michihiro (2 units)

Target〉 This class introduces the quantum mechanics.

Outline〉 Basics of quantum mechanics are introduced.

Style〉 Lecture

Goal〉 To understand the outline of quantum mechanics.

Schedule〉

1. Introduction
2. Variation
3. Lagrangian
4. Hamiltonian
5. The principles of quantum mechanics (1) Operator
6. The principles of quantum mechanics (2) Wavefunction
7. The principles of quantum mechanics (3) Expectation value
8. The principles of quantum mechanics (4) Schrödinger equation
9. Example (1) the square well potential
10. Example (2) the linear harmonic oscillator
11. Example (3) hydrogen atom
12. The principles of quantum mechanics (5) Heisenberg equation
13. Many-body problem
14. Field quantization
15. Phonon

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125121/

Contact〉 Yoshitaka Michihiro (A203)

Solid State Ionics

Assistant Professor · Koichi Nakamura (2 units)

Target〉 This class introduces topics in solid state ionics, conduction mechanism in ionic conductors and techniques to study solid state ionics.

Outline〉 Basic experimental and theoretical approaches to understand solid state ionics are introduced and discussed in terms of "ion dynamic".

Keyword〉 Ionic conductor, Ionic diffusion, Secondary battery

Goal〉

1. To understand basic physical and chemical properties of ionic conductors.
2. To understand basic technique to study ionic conductors.

Schedule〉

1. Introduction to solid state ionics
2. Band theory and conduction mechanism
3. Defect in Ionic crystal
4. Diffusion in solid
5. Diffusion mechanism in solid
6. Solid electrolyte
7. Mixed conductor
8. Electrical conductivity
9. Application - Ion secondary battery -
10. Application - Fuel cell -
11. Electrical conductivity measurement
12. Nuclear Magnetic Resonance
13. Ultrasonic measurement
14. Recent topics on solid state ionics
15. Future in solid state ionics
16. Test

Evaluation Criteria〉 期末試験で評価する.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125122/

Contact〉 Nakamura (A216, +81-88-656-7577, koichi@pm.tokushima-u.ac.jp)

Methods for analysis of mathematical phenomena

Professor · Hitoshi Imai (2 units)

Target〉 To learn the to analyze the mathematical phenomena.

Outline〉 Methods used in analysis of mathematical phenomena are introduced. Especially, those in numerical analysis are focused on.

Style〉 Lecture

Keyword〉 Mathematics, Numerical, Analysis

Fundamental Lecture〉 "Numerical Analysis"(1.0)

Relational Lecture〉 "Advanced Computational Science"(0.5, ⇒20 page)

Requirement〉 Only the premise that have studied basic mathematics.

Goal〉 The adequacy of the two-dimensional boundary value problem governed by the Poisson equation can be understood by the finite difference method, etc.

Schedule〉

1. Introduction to computer
2. Common sense in numerical computation
3. High-speed computation (Parallel computing)
4. Finite difference method I
5. Finite difference method II
6. Finite difference method III
7. Finite difference method IV
8. Finite element method I
9. Finite element method II
10. Finite element method III
11. Finite element method IV
12. Boundary element method I
13. Boundary element method II
14. Boundary element method III
15. Spectral method

Evaluation Criteria〉 Evaluation by the report.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125123/

Contact〉 Imai(A220, +81-88-656-7541, The inquiry by means of the cellular phone or E-mail is not acceptable)Office hours: Thursday 14:00-15:00

Differential Equations

Associate Professor · Nobuyoshi Fukagai (2 units)

Target〉 Introduction to mathematical theory of differential equations.

Outline〉 Boundary value problems of second order linear differential equations.

Style〉 Lecture

Keyword〉 微分方程式の境界値問題, Sturm-Liouville 問題

Goal〉 To be familiar with Sturm-Louville type equations.

Schedule〉

1. Introduction
2. Helmholtz's equation
3. Eigenvalues and eigenfunctions
4. Green's function
5. Residue analysis
6. Expansion of Green's function
7. Fourier series
8. Existence theorem
9. Sturm-Liouville problems
10. Characteristic function
11. Solvability of boundary value problems
12. Basic estimates
13. Distribution of eigenvalues
14. Eigenfunction expansion
15. Review

Reference〉 望月清 · トルシン 『数理物理の微分方程式』 培風館

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125124/

Student〉 Able to be taken by student of other department

Contact〉 工学部数学教室 (A 棟 219 室)

Advanced Computational Science

Professor · Toshiki Takeuchi (2 units)

Target〉 This class provides the basic technology for numerical calculation for the differential equation.

Outline〉 The numerical calculation methods for the differential equation are introduced.

Style〉 Lecture

Keyword〉 Numerical analysis, Numerical computation, Differential equation

Fundamental Lecture〉 "Numerical Analysis"(1.0), "Basic Mathematics"(1.0), "Basic Mathematics"(1.0)

Relational Lecture〉 "Methods for analysis of mathematical phenomena"(1.0, ⇒18 page), "Numerical Analysis"(1.0)

Requirement〉 Students have to understand basic mathematics of undergraduate-level.

Goal〉 To understand principle of numerical calculation methods.

Schedule〉

1. Introduction of numerical simulation
2. Mathematical model
3. Least squares method
4. Lagrange interpolation
5. Spline interpolation
6. Finite difference method
7. Arbitrary precision formula
8. Application to the 1-dimension differential equation
9. Application to the 2-dimension differential equation
10. Gauss-Seidel method
11. Successive Over-Relaxation method
12. Explicit method
13. Implicit method
14. Crank-Nicolson method
15. Numerical instabilities

Evaluation Criteria〉 Assignments count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127946/

Student〉 Able to be taken by only specified class(es)

Contact〉 Takeuchi (A206, +81-88-656-7544, takeuchi@pm.tokushima-u.ac.jp)

Topics of Analysis for Mathematical Science

Associate Professor · Atsuhito Kohda (2 units)

Target〉 Mathematical theory and technique for analysis of engineering phenomena

Outline〉 Mathematical theory to analyze problems in engineering and its application, mainly theory and technique of differential equations

Style〉 Lecture

Relational Lecture〉 "Advanced applied analysis"(0.2, ⇒22 page), "Differential Equations"(0.2, ⇒19 page)

Requirement〉 If you like undergraduate-level mathematics, it will be sufficient.

Goal〉 To be familiar with mathematical theory, that helps engineering study.

Schedule〉

1. Introduction to basic modern mathematics 1
2. Introduction to basic modern mathematics 2
3. Linearity and nonlinearity
4. Representation formula and existence of solutions 1
5. Representation formula and existence of solutions 2
6. Representation formula and existence of solutions 3
7. Behavior of solutions and problems of engineering 1
8. Behavior of solutions and problems of engineering 2
9. Solutions and spaces of functions 1
10. Solutions and spaces of functions 2
11. Solutions and spaces of functions 3
12. Topics of modern analysis 1
13. Topics of modern analysis 2
14. Mathematics and computer
15. Summary

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127945/

Contact〉 Kohda (A211, +81-88-656-7546, kohda@pm.tokushima-u.ac.jp)

Advanced applied analysis

Assistant Professor · Kuniya Okamoto (2 units)

Target〉 To learn the functional analytic methods which are basic tools for mathematical sciences.

Outline〉 This subject provides basic theory of functional analysis which is considered as linear algebra in infinite-dimensional spaces. Functional analytic approaches to phenomena described by differential equations are introduced.

Goal〉 To apply the theory of modern analysis and recognize its significant role.

Schedule〉

1. Introduction (What is functional analysis?)
2. Linear operators on finite-dimensional linear spaces
3. Eigenvalue problems
4. Matrix exponentials
5. Hilbert spaces, Banach spaces
6. Function spaces
7. Linear operators in infinite-dimensional linear spaces
8. Spectral resolutions
9. Fourier transforms
10. Operational calculus
11. Integral transforms, Resolvent operators
12. Strongly continuous semigroups
13. Abstract Cauchy problems
14. Applications to partial differential equations
15. Summary

Evaluation Criteria〉 Evaluation by the report.

Webpage〉 http://math9.pm.tokushima-u.ac.jp/lecture/

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127944/

Contact〉 岡本 (A212 室, TEL/FAX: 656-9441, E-mail: okamoto@pm.tokushima-u.ac.jp)

Advanced Water Resouces Engineering

Professor · Michio Hashino, *Associate Professor* · Hiroshi Takebayashi (4 units)

Target〉 The purpose of this subject is to learn models and theories on hydrological and sedimentological cycles in river basin.

Outline〉 In the first part of this subject, models and theories on hydrological cycle in river basin are introduced. The Muskingum method is a commonly used lumped flood routing method for handling a variable discharge-storage relationship. The kinematic wave model is the simplest distributed model defined by the continuity equation for an unsteady flow and the momentum equation assuming the friction and gravity forces balance each other. A report of solving problems related to lecture items is imposed. In the second part of this subject, calculation methods of bed material load on non-uniform sediment bed and one dimensional bed deformation analysis are lectured. Next, bed configurations like dunes and bars are introduced and two dimensional bed deformation analysis is described. Finally, grid generation methods and two dimensional bed deformation analysis in generalized coordinate system is lectured in order to understand the application method to natural rivers. This subject is related on engineering.

Style〉 Lecture

Keyword〉 Linear and non-linear lumped flood routing method, Kinematics distributed flood routing method, Non-uniform sediment, Two dimensional bed deformation analysis

Relational Lecture〉 "Applied Fluid Dynamics"(0.5, ⇒11 page), "Advanced Disaster Reduction Engineering"(0.5, ⇒24 page)

Requirement〉 not specified

Goal〉

1. Understand the theory of both linear and non-linear lumped and kinematics distributed flood rooting models.
2. Get the ability to calculate sediment transport rate on non-uniform sediment bed and understand 1D and 2D bed deformation analyses.

Schedule〉

1. Unit Hydrograph
2. Response Function
3. Discrete pulse Response Function
4. Unit Hydrograph Derivation
5. Lumped Flow Routing
6. Runge-Kutta Method
7. Muskingum Method
8. Linear Reseroir Model
9. Distributed Flow Routing
10. Classification of Distributed Routing Models
11. Kinematic Wave Celerity
12. Analytical Solution of Kinematic Wave
13. Finite-Difference Approximations
14. Numerical Solution of Kinematic Wave
15. Nolinear Kinematic Wave Scheme
16. Muskingum-Cunge Method
17. Calculation of critical bed shear stress for bed load on non-uniform sediment bed
18. Calculation of bed load transport rate on non-uniform sediment bed
19. Calculation of critical friction velocity for suspended sediment on non-uniform sediment bed
20. Calculation of suspended load transport rate on non-uniform sediment bed
21. 1D bed deformation analysis on non-uniform sediment bed 1
22. 1D bed deformation analysis on non-uniform sediment bed 2
23. 1D bed deformation analysis for generalized cross-sectional geometry
24. Examination
25. Bed configuration
26. 2D bed deformation analysis 1
27. 2D bed deformation analysis 2
28. Calculation of water velocity near bed surface
29. 2D bed deformation analysis with vegetated zone
30. Grid generation
31. 2D bed deformation analsys in generalized coordinate system
32. Examination

Evaluation Criteria〉 Report and tests.

Textbook〉 Resume is distributed during classes

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125125/

Contact〉

⇒ Hashino (A415, +81-88-656-7332, michio@ce.tokushima-u.ac.jp)
⇒ Takebayashi (A311, +81-88-656-7331, takeh@ce.tokushima-u.ac.jp)

Advanced Disaster Reduction Engineering

Associate Professor · Susumu Nakano (2 units)

Target〉 The purpose of this subject is to understand the present conditions in natural disaster reduction and to learn theory and technology about disaster reduction measures.

Outline〉 First, the present conditions for natural disaster reduction in Japan are presented. Next, effective methods to promote voluntary activities for disaster reduction are presented with practices.

Style〉 Lecture and excercise

Keyword〉 regional disaster reduction, voluntary activities of disaster reduction

Relational Lecture〉 "災害リスク論"(1.0), "Advanced Earthquake Engineering"(0.5, ⇒30 page), "Applied Fluid Dynamics"(0.5, ⇒11 page)

Requirement〉 not specified

Notice〉 not specified

Goal〉

1. To understand the present conditions in regional disaster reduction
2. To learn the basises of theory and technology for voluntary activities of disaster reduction

Schedule〉

1. Guidance, Outline of this subject
2. Strategy for natural disaster reduction
3. Strategy for earthquake disaster reduction
4. Voluntary activities of disaster reduction
5. Risk management for natural disaster in a company, report(1)
6. Damage assumption for the Nankai earthquake
7. Practice of disaster imaging (1)
8. Practice of disaster imaging (2)
9. Practice of disaster imaging (3)
10. Disaster imaging game "Crossroad"
11. Practice with the DIG game "Crossroad"
12. How to make a map for natural disaster reduction
13. Practice of making a map for natural disaster reduction (1)
14. Practice of making a map for natural disaster reduction (2)
15. Education for disaster reduction, Report(2)

Evaluation Criteria〉 marks of report (1) and (2) are summed with the weights of 4 and 6, respectively, and the passing mark is 60%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Webpage〉 http://hyd.ce.tokushima-u.ac.jp/suiko/index.htm

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/128167/

Student〉 Able to be taken by only specified class(es)

Contact〉 Nakano (A310, +81-88-656-7330, nakano@ce.tokushima-u.ac.jp)

Advanced Geomechanics

Professor · Takuo Yamagami (2 units)

Target〉 The purpose of this lecture is to let the students understand the three major solution procedures for problems in geomechanics, that is Limit Equilibrium Method, Limit Analysis Method and Slip Line Method, and their applications to practical situations such as slope stability, earth pressure and bearing capacity problems.

Outline〉 Beginning with fundamentals of effective stress analysis and total stress analysis, the lecture is given of limit equilibrium stability analysis method considering progressive failure, limit analysis method, slip line method, and their applications.

Style〉 Lecture

Keyword〉 Limit equilibrium method, Limit analysis, Slip line method

Fundamental Lecture〉 "Geomechanics"(1.0), "Soil Mechanics 2"(1.0), "Geotechnical Engineering"(1.0)

Relational Lecture〉 "Advanced Soil Mechanics"(0.5, ⇒27 page), "Advanced Foundation Engineering"(0.5, ⇒29 page)

Requirement〉 Students are required to have a good knowledge of undergraduate-level soil mechanics.

Goal〉

1. To understand shear failure of soils
2. To understand effective stress analysis and total stress analysis
3. To understand stability analysis of slopes considering progressive failure
4. To understand analysis procedure for stability problems

Schedule〉

1. Introduction
2. Effective stress analysis (part 1)
3. Effective stress analysis (part 2)
4. Total stress analysis
5. Limit equilibrium method (part 1)
6. Limit equilibrium method (part 2)
7. Progressive failure analysis of slope stability (part 1)
8. Progressive failure analysis of slope stability (part 2)
9. Progressive failure analysis of slope stability (part 3)
10. Limit analysis (part 1)
11. Limit analysis (part 2)
12. Limit analysis (part 3)
13. Slip line method (part 1)
14. Slip line method (part 2)
15. Summary
16. Semester examination

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125126/

Student〉 Able to be taken by only specified class(es)

Contact〉 Yamagami (A401, +81-88-656-7345, takuo@ce.tokushima-u.ac.jp)

Advanced Environmental Ecology

Associate Professor · Mahito Kamada (4 units)

Target〉 The purpose is to develop the knowledge and skill for conservation and restoration of ecosystems.

Outline〉 Current situation of ecosystems and technical problems for conservation and restoration are explained. The way of ecosystem management is emphasized to improve ecosystem. All students must give a presentation to introduce their own activities.

Style〉 Lecture

Keyword〉 Ecosystem management, Environmental conservation, Nature restoration

Goal〉 Every student has basic knowledge and skill to improve ecosystem function in the actual society.

Schedule〉

1. Guidance
2. Interdisciplinary aspects for ecosystem management 1
3. Interdisciplinary aspects for ecosystem management 2
4. Current situation and problems in ecosystem management 1
5. Current situation and problems in ecosystem management 2
6. Current situation and problems in ecosystem management 3
7. Current situation and problems in ecosystem management 4
8. View points to know the structure and function of ecosystems 1
9. View points to know the structure and function of ecosystems 2
10. View points to know the structure and function of ecosystems 3
11. View points to know the structure and function of ecosystems 4
12. Toward an adequate management of ecosystems 1
13. Toward an adequate management of ecosystems 2
14. Toward an adequate management of ecosystems 3
15. General discussion / Report

Evaluation Criteria〉 Result is evaluated by contents of the reports, which are set after every related lectures. Over 60% marks is necessary to pass.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125127/

Student〉 Able to be taken by student of other department and faculty

Contact〉 Kamada (A306, +81-88-656-9134, kamada@ce.tokushima-u.ac.jp)

Advanced Soil Mechanics

Associate Professor · Hisashi Suzuki (2 units)

Target〉 The purpose of this lecture is to learn the critical state mechanics which is formed a theoretical base of a modern soil mechanics for clay and sand.

Outline〉 The purpose of Advanced Soil Mechanics is to learn the critical state mechanics which is formed a theoretical base of a modern soil mechanics for clay and sand. Firstly, the results of typical experiments related to shear properties of a saturated clay are shown and a constituve law existing at stress-strain relationship of clays are explained. Secondally, the reltaionship is expanded to the thory of sand and the differences between clay and sand are made clear easily. The elasto-plastic theory for soil is explained using the cam clay model and its applications to numerical analysis are explained showing new research results. Finally, the critical soil mechanics is learned through this lecture.

Style〉 Lecture

Keyword〉 critical soil mechanics, cam clay model, flow rule, constitutive law for soils

Goal〉 Values of stress-strains and pore pressures for saturated soils in various states can be calculated by using critical state soil mechanics theory.

Schedule〉

1. cam clay model
2. shear properties of saturated clay
3. existence of critical state line
4. Drained and Undraind tests of normally consolidated clay
5. 3 dimensional expression of critical state line
6. existence of Roscoe Surface
7. shape of Roscoe Surface
8. behavior of overconsolidated clay
9. yield surface of Hvorslev Surface
10. the 2 and 3 dimensional complete stste boundary surface
11. mechanical behavior of sands
12. equivalent consoliated pressure
13. elasto-plastic theory of saturated clay
14. cam clay model
15. state boundary equation for cam clay model
16. term-end test

Evaluation Criteria〉 Degree of achievement for the aim is examined by the semester test and the passing mark is more than 60%.

Textbook〉 Some prints are distributed in lectures.

Webpage〉 http://www.ce.tokushima-u.ac.jp/www/jiban/jiban.html

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125128/

Contact〉 Suzuki(A403, 088-656-7347, suzuki@ce.tokushima-u.ac.jp)

City and Transport System Planning

Professor · Hideo Yamanaka, *Part-time Lecturer* · Masahiro Miyake (4 units)

Target〉 Advanced course on concept and case study of social and public policies on urban, regional and transport planning. Study on contents and usage of measures on such planing fields.

Outline〉 Lectures on Systems approaches on city planning and transport planning, theories and usage of planning models and planning methods. A unit is consisted of three hours llecture and an hour training.

Style〉 Lecture and excercise

Keyword〉 City Plannig, Transport Planning, Concensus Building

Fundamental Lecture〉 "Urban & Transport Planning"(1.0), "Project Evaluation Methods for Infrastructure Planning"(1.0)

Relational Lecture〉 "都市 · 地域計画論"(0.5), "Infrastructure Planning"(0.5)

Goal〉

1. Understanding of problems and recent strategies on city and transport planning
2. Understanding of concensus buidling method for developing city and transport strategies

Schedule〉

1. Problems of City and Transport Systems 1
2. Problems of City and Transport Systems 2
3. Recent Planning Strategies of City and Transport System 1
4. Recent Planning Strategies of City and Transport System 2
5. Recent Planning Strategies of City and Transport System 3
6. Recent Planning Strategies of City and Transport System 4
7. Debate by gropus on transport strategies
8. Method of Dicision Making and Social Concensus Building
9. Negociation theory and Concemnsus Building
10. Negociation Simulation 1
11. Negociation Simulation 2
12. Project Cycle Management Participatory Planning Method 1
13. Project Cycle Management Participatory Planning Method 2
14. Project Cycle Management Participatory Planning Method 3
15. Debate by groups on Concensus Building

Evaluation Criteria〉 Achievement level of the each target is evaluated by the submitted essays and reports. Score of 60points or over is required to clear the target. Students are required to clearr the both of targets. Total score is average of the scores of two targets.

Textbook〉 Textbook is ibtroduced in the class. Realted documents is distributed to students.

Reference〉 Rojer Fisher and Williamn Uly: Getting to yes, Houghton Miffin,1981

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125129/

Student〉 Able to be taken by student of other department

Contact〉 Yamanaka (A410, +81-88-656-7350, yamanaka@ce.tokushima-u.ac.jp)

Advanced Foundation Engineering

Professor · Akitoshi Mochizuki, *Assistant Professor* · Katsutoshi Ueno (4 units)

Target〉 The purpose of this lecture is to understand the method to analyze failure and deformation of soil structures. In this lecture, deformation and failure characteristics of soil and their modeling methods are explained first. In particular, shear testing apparatus, shear deformation and strength characteristics, are explained in detail. Then computer implementation of the model for deformation and failure characteristics of soil is explained in detail. Topics of this lecture are as follows: 1. Shear testing apparatus and test methods, 2. Basic shear deformation characterisics of soil and its application, 3. Introduction to finite element method, 4. Failure criteria and elast-plastic model of soil.

Outline〉 Purpose of this lecture is to let the students understand how to solve deformation and failure problems of foundation structures. Beginning with shear testing, the lecture is given shear deformation and strength characteristics of soil and their modeling for numerical methods, implementation of the numerical models into finite element method. Keywords are: 1 shear testing apparatus and methods, 2 Basic shear characteristics of soil and its application, 3 Foundamentals of finite element method, 4 failure criteria and elast-plastic constitutive model of soil.

Style〉 Lecture

Keyword〉 Finete Element Method, Elast-Plastic Constitutive Equation

Requirement〉 nothing

Notice〉 This class will be

Goal〉

1. To understand fundamentals of soil characteristics and its testing method
2. Modeling mechanical characteristics and installing to FEM, and analysis deformation and failure phenomenon of foundation stractures

Schedule〉

1. Shear test apparatus and method (Direct shear test) 1
2. Shear test apparatus and method (Direct shear test) 2
3. Shear test apparatus and method (conventional and true triaxial compression test) 1
4. Shear test apparatus and method (conventional and true triaxial compression test) 2
5. Fundamentals of shear defomation characteristica of soil 1
6. Fundamentals of shear defomation characteristica of soil 2
7. Failure criteria 1
8. Failure criteria 2
9. Stress-strain relationships of soil 1
10. Stress-strain relationships of soil 2
11. Modeling of stress-strain relationship of soil 1
12. Modeling of stress-strain relationship of soil 2
13. Constitutive equation of soil and its application 1
14. Constitutive equation of soil and its application 2
15. Basic of FEM and its programming 1
16. Basic of FEM and its programming 2
17. Features of geotechnical FEM 1
18. Features of geotechnical FEM 2
19. Impremention of constitutive model of soil 1
20. Impremention of constitutive model of soil 2
21. Introduce of failure criteria 1
22. Introduce of failure criteria 2
23. Introduce of stress dependency 1
24. Introduce of stress dependency 2
25. boundary condition
26. Loading of initial stress
27. Examples of analysis 1
28. Examples of analysis 2
29. exercises in analysis 1
30. exercises in analysis 2
31. exercises in analysis 3
32. report on object 2

Textbook〉 別途指示する.

Reference〉 別途指示する.

Webpage〉 http://kiso.ce.tokushima-u.ac.jp/~ueno/index.html

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125130/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Mochizuki (A405, +81-88-656-9721, motizuki@ce.tokushima-u.ac.jp)
⇒ Ueno (A406, +81-88-656-7342, ueno@ce.tokushima-u.ac.jp)

Advanced Earthquake Engineering

Professor · Tsutomu Sawada (2 units)

Target〉 To investigate characteristics of earthquake ground motions and dynamics of structures, and to understand their modeling techniques which are necessary for evaluating earthquake resisiting capacity and earthquake resistant design of structures.

Outline〉 In the lecture, the relation between earthquakes and ground motions, analytical method and modeling technique of earthquake ground motions and structures, dynamic response analysis of soils and structures, response spectrum and fundamental concept of earthquake resistant design of road bridges are explained.

Style〉 Lecture

Keyword〉 earthquake resistant design, highway bridge, response spectrum

Relational Lecture〉 "Advanced Structural Dynamics"(0.5, ⇒12 page)

Requirement〉 To have acquired the information of structural mechanics and vibration theory.

Goal〉 To understand the method of earthquake resistant design of highway bridges.

Schedule〉

1. Guidance
2. Characteristics of earthquake ground motions (1)
3. Characteristics of earthquake ground motions(2)
4. Basic concept of earthquake resistant design
5. Design earthquake ground motions(1)
6. Design earthquake ground motions(1)
7. Definition of earthquake resisting capacity
8. Evaluating method of earthquake resisting capacity
9. Static evaluation of earthquake resisting capacity(1)
10. Static evaluation of earthquake resisting capacity(2)
11. Static evaluation of earthquake resisting capacity(3)
12. Influence of ground conditions
13. Calculation of ultimate lateral strength of bridge pier(1)
14. Calculation of ultimate lateral strength of bridge pier(2)
15. Calculation of ultimate lateral strength of bridge pier(3)
16. Term examination

Evaluation Criteria〉 Term examination and report are marked out of 20 and 80 respectively and those marks are summed up. The passing mark is 60.

Textbook〉 Japan Road Association:Seismic design specifications of highway bridges, 2002.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125131/

Student〉 Able to be taken by only specified class(es)

Contact〉 Sawada (A307, +81-88-656-9132, sawada@ce.tokushima-u.ac.jp)

Advanced reinforced concrete engineering

Professor · Chikanori Hashimoto, *Associate Professor* · Takao Ueda (4 units)

Target〉 The objective of this subject is to understand the recent technology on methods of structual analysis of reinforced concrete structures and the recent technology on maintenance of reinforced concrete structures.

Outline〉 It is important that understanding the new type structures, the design method and the analytical method of concrete structures to realize a durable, safe and low-priced concrete structure. In this lecture, the realizing method of high performance concrete structures and the application of finite element method for concrete structures is explained, including the new type structures, application of new materials for concrete structures, PRC structures, the durability design and the slife cycle design. A lecture items is as follows. 1. Deteriration mechanism RC structures. 2. Evaluation of durability of RC structures. 3. Repair method of RC structures. 4. Programming of bending analysis for RC and PRC structures using the fiber model. 5. Basic concept of durability design. 6. Basic concept of life cycle design. 7. Engineering ethics for civil engineers.

Style〉 Lecture and excercise, Practice

Keyword〉 Programming of bending analysis, New materials nad new construction methods, Field visit, Deterioration mechanism, Evaluation of durability, Repair method, Life cycle design

Requirement〉 It is necessary for students to learn the basic attainments on the concrete technology and reinfroced concrete mechanics.

Notice〉 Each subject is lectured for 180 minutes such as two times as the lecture's time of usaally other subject. So be careful.

Goal〉

1. The purpose is to understand the recent technology on methods of structual analysis of reinforced concrete structures and the recent techinology on materials and construction methods concerned wtih reinfroced concrete structures.
2. The purpose is to understanind the recent techinology on maintenance of concrete structures.

Schedule〉

1. Guidance and Programming of bending analysis for RC and PRC structures using the fiber model (1).
2. Programming of bending analysis for RC and PRC structures using the fiber model (2).
3. Recent technology on application of the new materials for reinfroced concrete structures(1).
4. Recent technology on application of the new materials for reinforced concrete structures(2).
5. Recent technology on the new construction methods for reinforced concrete structures(1).
6. Recent technology on the new construction methods for reinforced concrete structures(2).
7. Field vist.
8. Enginnering ethics in practice the case study approach on construction of concrete stuructures.
9. Deterioration mechanism of reinforced concrete structures (1).
10. Deterioration mechanism of reinforced concrete structures (2).
11. Evaluation of durability of reinforced concrete structures (1).
12. Evaluation of durability of reinforced concrete structures (2).
13. Repair method of reinforced concrete structures (1).
14. Repair method of reinforced concrete structures (2).
15. Life cycle design of reinforced concrete structures.
16. Preliminary

Evaluation Criteria〉 Evaluate by reports for each subject.

Textbook〉 Handout of photo copying materials for each subject.

Reference〉 Standard Specifications for Concrete Structures, "Maintenance"

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125132/

Advanced Lecture in Technical English

Teacher of course (4 units)

Target〉 The purpose of this subject is to develop the ability of reading comprehension of English technical papers of each special field.

Outline〉 First, a technical paper of each special field is selected by students according to their teacher's instruction. Next, understanding of selected paper and translation of it into Japanese are made. Finally, translation reports are submitted and presented to their respective teachers. Number of papers selected in each semester is one.

Style〉 Portfolio

Keyword〉 Technical English, Reading comprehention, Translation into Japanese

Requirement〉 Students are required to have fundamental knowledge of English.

Goal〉 To translate English technical papers of each special field into Japanese.

Schedule〉

1. Guidance
2. Selection of a technical English paper in the first semester.
3. Reading comprehension and translation into Japanese.
4. Submission of translation report 1.
5. Oral examination 1.
6. Selection of a technical English paper in the second semester.
7. Reading comprehension and translation into Japanese.
8. Submission of translation report 2.
9. Oral examination 2.

Evaluation Criteria〉 Both of the reports(No.1 & No.2) are marked out of 50 and those marks are summed up. The passing mark is 60.

Textbook〉 Tech Talk Pre-Intermediate (Oxford University Press)

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125134/

Student〉 Able to be taken by only specified class.

Contact〉 Nariyuki (A510, +81-88-656-7326, nariyuki@ce.tokushima-u.ac.jp)

Technical English Conversation

Part-time Lecturer · Angus Alexander McDonald (2 units)

Target〉 The purpose of this subject is to develop technical English conversation ability of students who aim to be an international engineers.

Outline〉 Lecture and exercise on technical English conversation are given by a foreign teacher. In addion, preraration for TOEIC is partially included in this class.

Style〉 英語 (Speaking 中心)

Keyword〉 Technical English, English conversation, TOEIC

Requirement〉 Not specified.

Goal〉 To be fairly good at speaking English as a future engineer.

Schedule〉

1. Introduction and pre-course test.
2. First meeting and spelling
3. Saying what you want.
4. E-mail addresses and telephone messages
5. Describing controls, facilities and tests
6. Describing features, materials, shapes
7. Explaining what things do and dimensions.
8. Tools and equipment
9. Warning signs
10. Locating things
11. Suggesting solutions
12. Work tasks
13. Explaining functions
14. Reporting damage
15. Describing a project
16. Test

Evaluation Criteria〉 Based on attendance and test score.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125135/

Student〉 Able to be taken by only specified class.

Contact〉 Nariyuki (A510, +81-88-656-7326, nariyuki@ce.tokushima-u.ac.jp)

Note〉 English-Japanese and Japanese-English dictionaries should be brought without fail.

Advanced Structural Design

Associate Professor · Fumiaki Nagao (2 units)

Target〉 The purpose of this class is to evaluate the safety of structures based on the probabilistic models for static and dynamic lords and resistance variables and structural reliability theories

Outline〉 The probabilistic models for static and dynamic lords and resistance variables, some structural reliability theories and outlines of recent topics to structural design are explained.

Style〉 Lecture

Keyword〉 safety of structures, probabilistic models for loads, structural reliability theories

Relational Lecture〉 "Advanced Structural Dynamics"(0.5, ⇒12 page)

Goal〉 To understand the safety of structures

Schedule〉

1. probabilistic models for static and dynamic lords and resistance variables 1
2. probabilistic models for static and dynamic lords and resistance variables 2
3. probabilistic models for static and dynamic lords and resistance variables 3
4. probabilistic models for static and dynamic lords and resistance variables 4
5. probabilistic models for static and dynamic lords and resistance variables 5
6. limit state of structures 1
7. limit state of structures 2
8. evaluation of structural safety 1
9. evaluation of structural safety 2
10. evaluation of structural safety 3
11. evaluation of structural safety 4
12. evaluation of structural safety 5
13. recent topics to structural design 1
14. recent topics to structural design 2
15. recent topics to structural design 3

Evaluation Criteria〉 evaluated by attitude in class (80%) and reports (20%)

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/128166/

Contact〉 Nagao (A515, +81-88-656-9443, fumi@ce.tokushima-u.ac.jp)

Urban and Regional Planning

Professor · Akio Kondo (2 units)

Target〉 The concept and technique to describe not only the vision but also design in the future urban and regional plan are lectured.

Outline〉 The technique of urban and regional planning is explained using various materials in practical planning. The debate is introduced to develop the ability in design of planning for students.

Style〉 Lecture and excercise

Keyword〉 Urban and Regional Planning, Proposition of Vision, Planning Design

Fundamental Lecture〉 "Advanced Environmental Systems Engineering"(0.2, ⇒91 page)

Relational Lecture〉 "Information Engineering of Regional Environment"(0.8, ⇒40 page)

Requirement〉 特になし

Notice〉 特になし

Goal〉 To understand the concept and technique to describe the future urban and regional plan.

Schedule〉

1. Guidance and purpose of this subjec
2. Examples of urban planning
3. Examples of regional planning
4. Planning and law 1
5. Planning and law 2
6. Economic analysis in planning 1
7. Economic analysis in planning 2
8. Systems analysis in planning 1
9. Systems analysis in planning 2
10. Explanation of Exercise
11. Exercise of planning 1
12. Exercise of planning 2
13. Presentation of planning
14. Discussion about the future of region
15. Discussion about the vision of region

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/kondo/top/index.htm

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125221/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Note〉 特になし

Principle of Environmental Risk

Associate Professor · Yasunori Kozuki (2 units)

Target〉 To understand knowledge concerning the Environmental Risk and to develop effective program for risk communication.

Outline〉 To explain the definition and kinds of environment risk, risk evaluation and risk management. To develop a program for risk communication on the point of the environmental education.

Style〉 Lecture and excercise

Keyword〉 environmental risk, environmental education

Fundamental Lecture〉 "Advanced Environmental Systems Engineering"(1.0, ⇒91 page)

Relational Lecture〉 "mitigation engineering"(0.5, ⇒39 page), "Advanced Environmental Ecology"(0.5, ⇒172 page)

Goal〉 To be able to examine technique to mitigate and prevent the environmental risk

Schedule〉

1. Guidance and purpose of this subject
2. Example of the environmental risk
3. Surveying a subject about the environmental risk (1)
4. Surveying a subject about the environmental risk (2)
5. Surveying a subject about the environmental risk (3)
6. Surveying a subject about the environmental risk (4)
7. Midterm presentation
8. Surveying a subject about the environmental risk (5)
9. Surveying a subject about the environmental risk (6)
10. Surveying a subject about the environmental risk (7)
11. Surveying a subject about the environmental risk (8)
12. Surveying a subject about the environmental risk (9)
13. Presentation of results of surveying (1)
14. Presentation of results of surveying (2)
15. Discussion about the environmental risk in the future

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/134159/

Contact〉 Kozuki (Eco505, +81-88-656-7335, kozuki@eco.tokushima-u.ac.jp)

Note〉 特になし

Advanced building construction

Professor · Kiyoshi Hirao, · Part-time Lecturer (2 units)

Target〉 The purpose of this subject is to learn the basises of structure analysis, design caluculation and seismic safety evaluation of a building construction.

Outline〉 In the first half of this subject, matrix displacement method of framed structure/building is explained by professor K. Hirao, because the displacemennt method is widely used as a suitable method for computer programming. In the second place, invited extraordinary lecturer, who is a first class authorized practical architect and builder, introduces design calculation and seismic safety evaluation of a building construction.

Style〉 Lecture

Keyword〉 structure analysis, matrix displacement method, design calculation, seismic safety evaluation

Fundamental Lecture〉 "Advanced Fracture and Structural Mechanics"(1.0, ⇒13 page)

Requirement〉 Student are required to have a good understanding of undergraduate-level structure mechanics.

Goal〉

1. To understand the analytical method of a building by matrix displacement method
2. To understand the basises of design calculation and seismic safety evaluation of a building

Schedule〉

1. Guidance/Introduction
2. Definitions and conventions of a framed structure
3. Pin-jointed (truss) frames
4. Rigid-jointed (Rahmen) frames
5. Non standard frames
6. Neglect of axial strain in the analysis
7. Frames with inclined supports
8. Bandwidth of structure stiffness matrix
9. Basis of design calculation (part 1)
10. Basis of design calculation (part 2)
11. Basis of design calculation (part 3)
12. Basis of seismic safety evaluation (part 1)
13. Basis of seismic safety evaluation (part 2)
14. Basis of seismic safety evaluation (part 3)
15. 期末試験
16. Assignment of term paper

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125138/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kiyoshi Hirao Dept.of Civil Eng. (A building 5F room:A511, Tel.:088-656-7324, e-mail:cvsteng@ce.tokushima-u.ac.jp)Monday 16:40~ 19:30

Principles of Disaster Risk

Professor · Hitoshi Murakami (2 units)

Target〉 To understand concept of risk, risk management, damage reducing measure ability to natural disaster

Outline〉 To understand histrical earthquakes and tsunamis , characteristics of earthquake and tsunami, prediction of damage , to cultivate presentation skill and debate ability.

Keyword〉 Earthquakes and Tsunamis, Disaster Prevention Assessment, Risk Manegement

Relational Lecture〉 "Principle of Environmental Risk"(0.5, ⇒167 page)

Goal〉 Training-up of technical knowledge to the natural disaster, the basic knowledge which can correspond to the risk management and the crisis management

Schedule〉

1. Guidance, Outline of Disaster Risk
2. Natural Disasters and Their Regulations
3. Histrical Earthquakes and Tsunamis in Japan(No.1)
4. Histrical Earthquakes and Tsunamis in Japan(No.2)
5. Characteristics of Earthquake and Tsunami(No.1)
6. Characteristics of Earthquake and Tsunami(No.2)
7. Generation Characteristics of Nankai Earthquake and Tsunami(Focal Region and Wave Source Region)(No.1)
8. Generation Characteristics of Nankai Earthquake and Tsunami(Focal Region and Wave Source Region)(No.2)
9. Disaster Prevention Assessment for Earthquakes and Tsunamis(No.1)
10. Disaster Prevention Assessment for Earthquakes and Tsunamis(No.2)
11. Risk Management for Earthquakes and Tsunamis(No.1)
12. Risk Management for Earthquakes and Tsunamis(No.2)
13. Risk Management for Earthquakes and Tsunamis(No.3)
14. Risk Management for Earthquakes and Tsunamis(No.4)
15. Summary

Evaluation Criteria〉 Assignments Count 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125223/

Student〉 To be limited to students of course

Contact〉 Murakami (Eco504, +81-88-656-7334, murakami@eco.tokushima-u.ac.jp)Monday 16:20-17:50

mitigation engineering

Professor · Hideki Ueshima (2 units)

Target〉 To understand the background and the significance of mitigation and to acquire fundamental principles of mitigation technique.

Outline〉 To explain western environmental ideas, progress of coastal development and concept, history, technology and examples of mitigation

Style〉 Lecture

Keyword〉 District Improvement Plan for Disaster Mitigation, coastal environment, ecosystem, environmental restoration

Fundamental Lecture〉 "Principle of Environmental Risk"(1.0, ⇒167 page), "Principles of Disaster Risk"(1.0, ⇒38 page), "Urban and Regional Planning"(1.0, ⇒35 page)

Relational Lecture〉 "Advanced Environmental Ecology"(0.5, ⇒172 page), "Advanced Environmental Systems Engineering"(0.5, ⇒91 page)

Goal〉 To acquire ideas and fundamental of mitigation

Schedule〉

1. Guidance of this subject
2. Background and history of the mitigation
3. Coastal development(1)
4. Coastal development(2)
5. Deterioration of costal environment
6. Restoration for coastal environment
7. Mitigation for coastal environment(1)
8. Mitigation for coastal environment(2)
9. Mitigation technology(1)
10. Mitigation technology(2)
11. Mitigation technology(3)
12. Example of mitigation in Western Europe
13. Example of mitigation in Japan(1)
14. Example of mitigation in Japan(2)
15. Discussion

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125228/

Contact〉 Ueshima (National Institute of Advanced Industrial Science and Technology, +81-823-72-1901, h-ueshima@aist.go.jp)

Information Engineering of Regional Environment

Associate Professor · Yoshinobu Hirose (2 units)

Target〉 The information of regional environment, technique in survey, information management and computer aid systems are explained. The method and technique using for application of environmental information to development of regional policies are lectured.

Outline〉 The information of regional environment, technique in survey, information management and computer aid systems are explained using the various kinds of materials and examples in practical planning.

Style〉 Lecture and excercise

Keyword〉 Information of Regional Environment, Technique in Survey, Computer Aid Systems

Relational Lecture〉 "Urban and Regional Planning"(0.8, ⇒35 page), "Advanced Environmental Systems Engineering"(0.2, ⇒91 page)

Requirement〉 特になし

Notice〉 特になし

Goal〉 To obtain the knowledge of the information of regional environment, technique in survey, information management and computer aid systems, and apply them to design of regional plan and political simulation.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of information of regional environment
3. Variety of information of regional environment
4. Technique in survey of information
5. Technique in production of information
6. Technique in management of information
7. Computer aid systems 1
8. Computer aid systems 2
9. Application of information to regional planning
10. Exercise of application of information 1
11. Exercise of application of information 2
12. Exercise of application of information 3
13. Presentation of results of exercise
14. Discussion about the information in the future
15. Discussion about the technique in the future

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/kondo/top/index.htm

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125222/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Note〉 特になし.

Advanced Civil and Environmental Engineering Seminar

Teacher of course (4 units)

Target〉 The first purpose of this subject is to obtain the fundamental knowledge regarding research theme and develop the abilities to find and solve problems and present the results of research. The second one is to improve the ability to communicate in English by taking TOEIC.

Outline〉 Papers regarding research theme are read. The reports on contents of those papers are submitted to your own techears. The contents of those reports are presented at seminars. In addition, taking TOEIC is required.

Style〉 Portfolio

Keyword〉 Civil and Environmental Engineering, Paper, Seminar, TOEIC

Notice〉 Students should follow their own teacher's advices on how to find papers to be read and schedule for seminars and promptly inform their own teachers of scores on TOEIC every time without fail.

Goal〉

1. To obtain the fundamental knowledge regarding research theme and the presentation ability.
2. To get a larger score on TOEIC than criteria set separately by specified course.

Schedule〉

1. Guidance
2. Seminar on research theme
3. TOEIC

Evaluation Criteria〉 Attainment level of goal 1 is evaluated by presentations and submitted materials in seminars and passing mark is 60%. Attainment level of goal 2 is evaluated from the score on TOEIC and passing mark is 60%. To get credits of this subject, it is necessary to pass both criteria. Grade is finally calculated by summing both marks with the weights of 60% and 40%, respectively.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125141/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

⇒ Nariyuki (A510, +81-88-656-7326, nariyuki@ce.tokushima-u.ac.jp)

Advanced Civil and Environmental Engineering Exercise

Teacher of course (4 units)

Target〉 The purpose of this subject is to obtain deeper knowledge of related phenomena and develop the abilities to find and solve problems and creativity through some exercises toward each Master's thesis.

Outline〉 Exercises for discovering and solving various problems related to research theme are performed.

Style〉 Portfolio

Keyword〉 Exercise, Discovery of problem, Solution of problem, Civil and Environmental Engineering

Goal〉 To understand how to discover and solve problems regarding research theme.

Schedule〉

1. Guidance
2. Discovery of problems
3. Investigation on the method for solving problems
4. Report

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125142/

Student〉 Able to be taken by only specified class(es)

Contact〉 Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Advanced Civil and Environmental Engineering Laboratory

Teacher of course (4 units)

Target〉 The purpose of this subject is to obtain deeper knowledge of related phenomena and develop the abilities to find and solve problems and creativity through some experiments and investigations toward each Master's thesis.

Outline〉 Experiments and investigations are performed toward Master's thesis.

Style〉 Portfolio

Keyword〉 Experiment, Investigation, Master's thesis

Goal〉 To understand how to discover and solve problems regarding research theme.

Schedule〉

1. Guidance
2. Discovery of problems
3. Designs of experiments and Investigations
4. Experiments and Investigations
5. Report (Master's thesis)

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125143/

Student〉 Able to be taken by only specified class(es)

Contact〉 Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Advanced Internship on Civil and Environmental Engineering

Teacher of course (8 units)

Target〉 To make clear images on future jobs from wider aspects and increase knowledge and technical skill to the levels applicable in actual scenes.

Outline〉 Actual works at out of the university such as research institutes, govermental office, private enterprise,etc. are experienced.

Style〉 Portfolio

Keyword〉 Internship, Extension, Special knowledge, Special technique

Notice〉 Propriety and place of practice must be decided after a consultation with a supervisor.

Goal〉 To master practical knowledge and technical skill.

Schedule〉

1. Guidance
2. Consultation with supervisor about practice
3. Practical Exercise
4. Report
5. Presentation

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125144/

Student〉 Able to be taken by only specified class(es)

Contact〉 Nariyuki (A510, +81-88-656-7326, nariyuki@ce.tokushima-u.ac.jp)

Intelligent Structures and Mechanics Systems Engineering — Civil and Environmental Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Management of Technology ..... WEB page, CMS
  - Presentation Method (M) ..... WEB page, CMS
  - Internship (M) ..... WEB page, CMS
  - Venture Business (M) ..... WEB page, CMS
- *Common Subjects*
  - Applied Fluid Dynamics ..... WEB page, CMS
  - Advanced Structural Dynamics ..... WEB page, CMS
  - Advanced Fracture and Structural Mechanics ..... WEB page, CMS
  - Advanced Properties of Material ..... WEB page, CMS
  - Project Management ..... WEB page, CMS
- *Basic Departmental Subjects*
  - Quantum mechanics and advanced lecture in quantum physics ..... WEB page, CMS
  - Solid State Ionics ..... WEB page, CMS
  - Methods for analysis of mathematical phenomena ..... WEB page, CMS
  - Differential Equations ..... WEB page, CMS
  - Advanced Computational Science ..... WEB page, CMS
  - Topics of Analysis for Mathematical Science ..... WEB page, CMS
  - Advanced applied analysis ..... WEB page, CMS
- *Applied Departmental Subjects*
  - Advanced Water Resouces Engineering ..... WEB page, CMS
  - Advanced Disaster Reduction Engineering ..... WEB page, CMS
  - Advanced Geomechanics ..... WEB page, CMS
  - Advanced Environmental Ecology ..... WEB page, CMS
  - Advanced Soil Mechanics ..... WEB page, CMS
  - City and Transport System Planning ..... WEB page, CMS
  - Advanced Foundation Engineering ..... WEB page, CMS
  - Advanced Earthquake Engineering ..... WEB page, CMS
  - Advanced reinforced concrete engineering ..... WEB page, CMS
  - Advanced Lecture in Technical English ..... WEB page, CMS
  - Technical English Conversation ..... WEB page, CMS
  - Advanced Structural Design ..... WEB page, CMS
  - Urban and Regional Planning ..... WEB page, CMS
  - Principle of Environmental Risk ..... WEB page, CMS
  - Advanced building construction ..... WEB page, CMS
  - Principles of Disaster Risk ..... WEB page, CMS
  - mitigation engineering ..... WEB page, CMS
  - Information Engineering of Regional Environment ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Civil and Environmental Engineering Seminar ..... WEB page, CMS
  - Advanced Civil and Environmental Engineering Exercise ..... WEB page, CMS
  - Advanced Civil and Environmental Engineering Laboratory ..... WEB page, CMS
  - Advanced Internship on Civil and Environmental Engineering ..... WEB page, CMS

Intelligent Structures and Mechanics Systems Engineering — Mechanical Engineering
Syllabus of subjects

List of Subjects

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125105/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125106/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Management of Technology

Associate Professor · Tatsuya Deguchi (2 units)

Target〉 About the production management of the automobile industry, it is understood variously from the point of view such as ”research and development”, ”production management”, ”purchasing” and ”quality control” ”marketing” and ”cross-cultural management”.

Outline〉 It learns about the production management. This time, ”the automobile industry” specially takes up the production management of ”Honda Motor Co.,Ltd. (following Honda)” even of that in the case, and the class to appreciate that importance with ranking of technology in management is taken.

Requirement〉 Finish ” Introduction to new business ” or ” Advanced Lecture in management Theory of new business ” .

Notice〉 Face a class when a taking lecture person surely does enough preparation every time. And moreover, be the worst, but one person one time is to do some remarks every time.

Goal〉

1. The elementary knowledge of management is learned.
2. Ranking of the technology in management and that importance are appreciated.
3. It learns how to solve the various problems which always occur in the spot of the management through the case study and the business game.

Schedule〉

1. Guidance
2. Lecture ”What in Management of Technology?”
3. Case report ”Rsearch and development of Honda”
4. Case study ”Plan an overseas factory.” ”A new car development order”
5. Lecture ” Production management and purchasing”
6. Lecture ”Quality control”
7. Case report ”The production management of Honda”,”The supply chain management of Honda”
8. Case study ”Plan an overseas factory.”
9. Case report ”The quality control of Honda”
10. Case study ”Don't make material defects flare up again.”
11. Lecture ”Marketing strategy”
12. Lecture ”Cross-cultural management”
13. Case report ”Around the products project of Honda - the two-wheeled vehicle ”
14. Case report ”The path of internationalization of Honda”
15. Case report ”The personnel management of Honda”
16. Summary and questions and answers

Evaluation Criteria〉 It is evaluated in the remark (20%) in class and the middle, end of a term report (80% in total).

Textbook〉 It doesn't specially use.The summary and so on is distributed every time.

Reference〉 Several are introduced in class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125107/

Student〉 The person who finished ”Introduction to new business” or ” Advanced Lecture in management Theory of new business “ in all the students enrolled in the doctor former term course. And, the number of taking lecture people is restricted to do intensive learning. (20-25 people will be made an upper limit.) It is selected with some means in case of a taking lecture person many.

Note〉 This class invites seven Honda alumnuni who did work in ”research and development”, ”production management”, ”purchasing”, ”quality control”, ”marketing” , ”cross-culutural management”, and so on as an instructor, and it is the class to do case report. Even if it is seen nationwide, the trial done like this is very rare, and it is a precious class. And, an applicant for taking lecture is to attend it in the guidance to hold it in advance.A schedule is indicated separately.

Presentation Method (M)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125108/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (M)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal.
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125109/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (M)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125110/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Applied Fluid Dynamics

Professor · Takeshi Okabe, Kunihiko Ishihara (2 units)

Target〉 This theme is concerned with Flow-induced vibration and noise. The aimof this theme is to understand the generation mechanism and to learn the prediction and countermeasure techniques

Outline〉 In application of fluid dynamics, there are two aspects such as the performance and safty of turbomachines. This theme discusses how the fluid dunamics is applied to the safty design about several examples described below. 1. Vibration of turbomachine blade, 2. Flow-induced vibration of structures in a piping syatem. 3. Vibration of heat exchanger tube bundles, 4. Areroacoustics, 5. Self sustaine tone, etc. The aim of this theme is to understand their generation mechanisms and to train the ability of obtaining the countermeasure's plan

Keyword〉 Aeroacoustics, Flow-induced vibration, Self-sustained tone, Noise

Relational Lecture〉 "Energy Conversion System"(0.5, ⇒69 page), "Advanced Applied Dynamics of Machine"(0.5, ⇒54 page)

Requirement〉 Fundamental knowledge of fluid dynamics and vibration engiuneering is necessary

Notice〉 not specified

Goal〉 training of researcher and engineer in an enterprise

Schedule〉

1. Guidance(Flow-induced vibration and noise)
2. Fundamental knowledge of acoustics(1)(Nature of sound)
3. Fundamental knowledge of acoustics(2)(Distant attenuation of sound)
4. Fundamental knowledge of acoustics(3)(Difraction of sound)
5. Intermediate tesut(1) and samarise
6. Aeroacoustics(1) (Present state of investigation of aeroacoustics)
7. Aeroacoustics(2) (Kind of aeroacoustics and basic equation)
8. Aeroacoustics(3) (Prediction method of sound from cylindrical body)
9. Aeroacoustics(4) (Prediction method of sound from plate)
10. Intermediate test(2) and samarise
11. Flow-induced vibration(1) (Examples of trouble)
12. Flow-induced vibration(2) (Cause of vibration of cylindrical structure)
13. Flow-induced vibration(3) (Shirking of self excited vibration)
14. Flow-induced vibration(4) (Steady drag force and random vibration)
15. Flow-induced vibration(5) (Vibration of tube array)
16. Final test

Evaluation Criteria〉 aberage of tests (1)~ (3) and reports are summed with the weights of 7 and 3, respectively, and the passing mark is 60%.

Textbook〉 prints

Reference〉 not specified

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/131204/

Student〉 Able to be taken by only specified class(es)

Contact〉 Ishihara (M518, +81-88-656-7366, ishihara@me.tokushima-u.ac.jp)

Advanced Applied Dynamics of Machine

Associate Professor · Junichi Hino (2 units)

Target〉 The basic technologies which evaluate and control dynamic behavior of mechnical systems and their applied technologies are made to master.

Outline〉 The theoretical and experimental modal analysis methods to grasp dynamic properties of structures and derive mathematical models are studied. In recent vibration analysis, the vibration analysis procedures with computers are of increasing mportance. The algorithms to solve eignevalue problems and numerical Integration methods of ordinary differential equations are introduced. Subsequently, active and passove vibration control methods of mechanical systems are studied are lectured.

Style〉 Lecture

Keyword〉 Vibration Analysis, Modal Analysis, Vibration Control

Requirement〉 Students are required to have a good understanding of undergraduate-level appied mechancs and related subjects.

Goal〉

1. To understand dynamic design method
2. To understand modal analysis
3. To aqcuire computer vibration analysis precedure
4. To understand vibration control method

Schedule〉

1. Modeling and formulation of mechanical systems 1
2. Modeling and formulation of mechanical systems 2
3. Eigenvalue problem and solution 1
4. Eigenvalue problem and solution 2
5. Computational analysis of mechanical systems 1
6. Computational analysis of mechanical systems 2
7. Experimental modal analysis 1 (vibration test)
8. Experimental modal analysis 2 (identification method)
9. Experimental modal analysis 3 (identification method)
10. Active and passive control methods
11. Vibration control with a dynamic absorber
12. Vibration control and state equation
13. Vibration control, pole placement method
14. Vibration control, optimal control 1
15. Vibration control, optimal control 2
16. Examination

Evaluation Criteria〉 Assignments count 50% and examinations count 50%

Textbook〉

- ◇ Printed synopses are used.
- ◇ To be introduced in thte class

Reference〉 To be introduced in thte class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/131205/

Student〉 Able to be taken by only specified class(es)

Contact〉 Hino (M422, +81-88-656-7384, hino@me.tokushima-u.ac.jp)

Advanced Fracture and Structural Mechanics

Professor · Ri-ichi Murakami, *Associate Professor* · Teruaki Ito (2 units)

Target〉 Because the machine and structure should be safety, it is important to evaluate the stress distribution in front of the defect like crack which is in the component of machine. In Fracture Mechanics, the stress distribution is expressed by stress intensity factor, K. Also, the fracture of component depends on fracture toughness of material. In this lecture, it is explained that for the defect like crack, how the stress intensity factor is expressed. It is then mentioned that how the fracture is toughness evaluated. The students should submit the reports each exercises. Finaly, the knowledge of safety design and fracture prevention for machine and structure can be mastered.

Outline〉 The purpose of fracture mechanics is the evaluation of the strength and fracture of machine and structure and then is the guarantee of safety of machine and structure. We should study the mechanical behavior of crack, the stress distribution in front of crack, the fracture analysis by fracture mechanics and the nonlinear mechanical behavior of elastic-plastic state. It is explained the theory of safety design and prevention of fracture for machine and structure.

Keyword〉 fracture, safety design, crack, machine/structure, stress intensity factor

Relational Lecture〉 "Solid Mechanics"(0.5, ⇒63 page), "Material Engineering"(0.5, ⇒64 page), "Physical properties of materials"(0.5, ⇒56 page)

Goal〉

1. Concept of Fracture Mechanics
2. Application to fracture anaysis of stress intensity factor
3. Concept of Fracture Toughness
4. Concept of J Integral

Schedule〉

1. Introduction of linear fracture mechanics
2. Stress intensity factor
3. Fracture toughness and fracture analysis
4. Safety design of machine by fracture mechanics
5. Elastic-plastic deformation in front of crack tip
6. Linear and nonlinear fracture mechanics
7. Midterm examination
8. Concept of J integral
9. Evaluation method of J integral
10. Fracture toughness by J integral
11. Condition of fracture initiation
12. Stabe and unstable fracture
13. Application of nonlinear fracture mechanics
14. Fracture analysis by nonlinear fracture mechanics
15. Summary

Evaluation Criteria〉 Over 60% of group discussion, reports and examination

Textbook〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/131206/

Contact〉 Murakami (M318, +81-88-656-7392, murakami@me.tokushima-u.ac.jp)Monday 16:00-17:00

Physical properties of materials

Associate Professor · Tatsuya Okada, Hideo Nishino (2 units)

Target〉 Electron microscopy, the most effective observation method of crystallographic defects which dominate mechanical properties of materials, is briefly discribed. Ultrasonic propagation phenomena depending on the elastic properties of materials and their applicaitons are also described.

Outline〉 Mechanical properties of crystalline materials are dominated by microscopic lattice defects. In the first half of this lecture, transmission electron microscopy, a powerful experimental method for direct observation of microscopic defects in materials, is discussed. Emphasis is put on the understanding of crystal orientation determination from electron diffraction patterns, based on the idea of reciprocal lattice. In the last half of this lecture, basic properties of wave propagation for ultrasonic material characterizations are discussed. The aim of the lecture is to give ultrasonic propagation phenomena. Several theoretical deductions of the wave equation from the continuity equation, the Navier-Stokes equation, the equation of state and the energy conservation low, respectively, and wave simulations are also shown in the lecture.

Style〉 Lecture

Keyword〉 transmission electron microscopy

Fundamental Lecture〉 "Material Engineering"(1.0, ⇒64 page)

Goal〉

1. To understand the Ewald sphere construction for the analysis of electron diffraction patterns.
2. To understand the wave equation for 3-dimentional anisotropic solid material and computer simulation for wave-propagation.

Schedule〉

1. Crystal and space lattice
2. Direction and plane in lattice
3. Bragg's law
4. Ewald sphere construction
5. Reciprocal lattice of simple space lattice
6. Structure factor
7. Electron diffraction pattern from single crystal
8. Introduction of wave propagations and NDI techniques with ultrasounds
9. Displacement, stress and strain of 3-dimentional anisotropic solid material
10. Methematical deduction of wave equation for 3-dimentioal anisotropic solid material
11. Physical meanings of wave equation
12. Finite differential simulation of wave equation
13. Boundary descriptions for wave equation
14. Physics for ultrasonic guided waves
15. Methematics for SH mode guided waves
16. examination

Evaluation Criteria〉 Assignment 50%, Examination 50%

Reference〉 坂著「結晶電子顕微鏡学」(内田老鶴圃)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/131207/

Contact〉

⇒ Okada (M616, +81-88-656-7362, t-okada@me.tokushima-u.ac.jp)
⇒ Nishino (M618, +81-88-656-7357, nishino@me.tokushima-u.ac.jp)

Project Management

Assistant Professor · Susumu Namerikawa (2 units)

Target〉 The purpose of this lecture is to understand PMBOK (Project Management Body of Knowledge), which is global standard in project management.

Outline〉 This lecture is outlined as follows: A)Current of global standardize pivoted on U.S. in project management. B)PMBOK (Project Management Body of Knowledge), which is global standard in project management.

Style〉 Lecture

Keyword〉 PMBOK

Fundamental Lecture〉 "Construction Business Management"(0.2)

Goal〉 Understanding of project management body of knowledge

Schedule〉

1. Guidance
2. Project and Project Management
3. Initiating Processes
4. Project Charter
5. Scope and WBS
6. Resource Planning and Estimate
7. Control of Project Planning 1
8. Control of Project Planning 2
9. Develop Project Planning 1
10. Develop Project Planning 2
11. Develop Project Team
12. Performance Measurement Baseline
13. Change Control
14. Closing Processes
15. Professional Responsibility
16. Semester Examination

Evaluation Criteria〉 Achievement level of the target is evaluated by the semester examination. Score of 60points or over is required to clear the target.

Textbook〉 Textbook is ibtroduced in the class. Realted documents is distributed to students.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127921/

Student〉 Able to be taken by student of other department

Contact〉 Namerikawa (A412, +81-88-656-9877, namerikawa@ce.tokushima-u.ac.jp)

Quantum mechanics and advanced lecture in quantum physics

Associate Professor · Yoshitaka Michihiro (2 units)

Target〉 This class introduces the quantum mechanics.

Outline〉 Basics of quantum mechanics are introduced.

Style〉 Lecture

Goal〉 To understand the outline of quantum mechanics.

Schedule〉

1. Introduction
2. Variation
3. Lagrangian
4. Hamiltonian
5. The principles of quantum mechanics (1) Operator
6. The principles of quantum mechanics (2) Wavefunction
7. The principles of quantum mechanics (3) Expectation value
8. The principles of quantum mechanics (4) Schrödinger equation
9. Example (1) the square well potential
10. Example (2) the linear harmonic oscillator
11. Example (3) hydrogen atom
12. The principles of quantum mechanics (5) Heisenberg equation
13. Many-body problem
14. Field quantization
15. Phonon

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125146/

Contact〉 Yoshitaka Michihiro (A203)

Superconductivity and superconducting materials

Professor · Yutaka Kishimoto (2 units)

Target〉 To understand basics and recent developments in superconductivity.

Outline〉 This class reviews quantum mechanics and introduces superconductivity and recent superconducting materials.

Style〉 Lecture

Keyword〉 superconductivity, Cooper pair, superconducting energy gap, density of states, anisotropic superconductivity

Goal〉 To understand the outline of superconductivity.

Schedule〉

1. Introduction to superconductivity
2. Review of quantum mechanics (1), Schrödinger equation and wave function
3. Review of quantum mechanics (2), operators and expected values
4. Review of quantum mechanics (3), perturbation theory
5. Free electron model of metals
6. Phenomenological theory of superconductivity
7. To understand Meissner effect on the basis of quantum mechanics
8. Formation of Cooper pair
9. Formation of superconducting energy gap
10. Density of states, and energy gap at finite temperatures
11. Introduction to Nuclear Magnetic Resonance method
12. Frontier of superconductivity (1), strong coupling superconductor
13. Frontier of superconductivity (2), heavy Fermion superconductor
14. Frontier of superconductivity (3), copper oxide high Tc superconductor
15. Summary

Evaluation Criteria〉 Reports on several subjects in the class.

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125147/

Contact〉 Kishimoto (A202, +81-88-656-7548, yutaka@pm.tokushima-u.ac.jp)

Advanced Computational Science

Professor · Toshiki Takeuchi (2 units)

Target〉 This class provides the basic technology for numerical calculation for the differential equation.

Outline〉 The numerical calculation methods for the differential equation are introduced.

Style〉 Lecture

Keyword〉 Numerical analysis, Numerical computation, Differential equation

Fundamental Lecture〉 "Numerical Analysis"(1.0), "Basic Mathematics"(1.0), "Basic Mathematics"(1.0)

Relational Lecture〉 "Methods for analysis of mathematical phenomena"(1.0, ⇒18 page), "Numerical Analysis"(1.0)

Requirement〉 Students have to understand basic mathematics of undergraduate-level.

Goal〉 To understand principle of numerical calculation methods.

Schedule〉

1. Introduction of numerical simulation
2. Mathematical model
3. Least squares method
4. Lagrange interpolation
5. Spline interpolation
6. Finite difference method
7. Arbitrary precision formula
8. Application to the 1-dimension differential equation
9. Application to the 2-dimension differential equation
10. Gauss-Seidel method
11. Successive Over-Relaxation method
12. Explicit method
13. Implicit method
14. Crank-Nicolson method
15. Numerical instabilities

Evaluation Criteria〉 Assignments count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125148/

Student〉 Able to be taken by only specified class(es)

Contact〉 Takeuchi (A206, +81-88-656-7544, takeuchi@pm.tokushima-u.ac.jp)

Methods for analysis of mathematical phenomena

Professor · Hitoshi Imai (2 units)

Target〉 To learn the to analyze the mathematical phenomena.

Outline〉 Methods used in analysis of mathematical phenomena are introduced. Especially, those in numerical analysis are focused on.

Style〉 Lecture

Keyword〉 Mathematics, Numerical, Analysis

Relational Lecture〉 "Advanced Computational Science"(0.5, ⇒60 page)

Requirement〉 Only the premise that have studied basic mathematics.

Goal〉 The adequacy of the two-dimensional boundary value problem governed by the Poisson equation can be understood by the finite difference method, etc.

Schedule〉

1. Introduction to computer
2. Common sense in numerical computation
3. High-speed computation (Parallel computing)
4. Finite difference method I
5. Finite difference method II
6. Finite difference method III
7. Finite difference method IV
8. Finite element method I
9. Finite element method II
10. Finite element method III
11. Finite element method IV
12. Boundary element method I
13. Boundary element method II
14. Boundary element method III
15. Spectral method

Evaluation Criteria〉 Evaluation by the report.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125149/

Contact〉 Imai(A220, +81-88-656-7541, The inquiry by means of the cellular phone or E-mail is not acceptable)Office hours: Thursday 14:00-15:00

Solid State Ionics

Assistant Professor · Koichi Nakamura (2 units)

Target〉 This class introduces topics in solid state ionics, conduction mechanism in ionic conductors and techniques to study solid state ionics.

Outline〉 Basic experimental and theoretical approaches to understand solid state ionics are introduced and discussed in terms of "ion dynamic".

Keyword〉 Ionic conductor, Ionic diffusion, Secondary battery

Goal〉

1. To understand basic physical and chemical properties of ionic conductors.
2. To understand basic technique to study ionic conductors.

Schedule〉

1. Introduction to solid state ionics
2. Band theory and conduction mechanism
3. Defect in Ionic crystal
4. Diffusion in solid
5. Diffusion mechanism in solid
6. Solid electrolyte
7. Mixed conductor
8. Electrical conductivity
9. Application - Ion secondary battery -
10. Application - Fuel cell -
11. Electrical conductivity measurement
12. Nuclear Magnetic Resonance
13. Ultrasonic measurement
14. Recent topics on solid state ionics
15. Future in solid state ionics
16. Test

Evaluation Criteria〉 期末試験で評価する.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127922/

Contact〉 Nakamura (A216, +81-88-656-7577, koichi@pm.tokushima-u.ac.jp)

Solid Mechanics

Professor · Katsutoshi Yamada, *Assistant Professor* · Atsuya Oishi (2 units)

Target〉 The purpose of this subject is to give the basic of solid mechanics and finite element method,which is important for design of strength of machines and structures.

Outline〉 In the first half of this lecture, first the basic of elasticity is given and then method of analysis is discussed fmainly for the two dimensional problems. In the last half of this lecture, the basic and application of FEM are explained.

Style〉 Lecture and excercise

Keyword〉 Elasticity, Finite Element Method

Relational Lecture〉 "Advanced Computational Science"(0.5, ⇒60 page), "Methods for analysis of mathematical phenomena"(0.5, ⇒61 page)

Goal〉

1. The understandings of the basic and the method of analysis for elasticity(Program 1-8)
2. The understandings of the basic and formulation of finite element method(Program 9-11)
3. The understandings of the basic for FEM programming(Program 12-15)

Schedule〉

1. Analysis of stress
2. Analysis of strain
3. Constitutive equations
4. Govering equations of elasticity
5. Principles of energy and variational methods
6. Two dimensional problems
7. Thermal stress
8. Intermidiate test
9. Formulation of FEM
10. Simulations and visualization of FEM
11. Basic of computational science
12. Algorism of mesh generation
13. Method of solving for linear equations (direct method)
14. Method of solving for linear equations (iteration method)
15. Programming of FEM
16. Final test

Evaluation Criteria〉 Intermidiate test 50%, final test 50%, total more than60% pass

Reference〉

- ◇ Theory of Elasticity 3rd, S.P.Timoshenka and J.N.Goodier, McGraw-Hill, 1970.
- ◇ The finite Element Method 3rd, O.C.Zienkiewicz, McGraw-Hill, 1977.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125150/

Student〉 only corresponging students for the course

Contact〉

⇒ Yamada (M621, +81-88-656-7364, yamada@me.tokushima-u.ac.jp)Friday 17:00-18:00
⇒ Oishi (M622, +81-88-656-7365, oishi@me.tokushima-u.ac.jp)

Material Engineering

Professor · Kenichi Yoshida, *Associate Professor* · Hitoshi Takagi (2 units)

Target〉 This class acquires the knowledge on solidification and growth, transformation, heat treatment, thermomechanical treatment in materials, material structure control and composite materials

Outline〉 Recent research development is remarkable in the material field. Solidification and growth of materials, transformation, heat treatment and thermomechanical treatment will be introduced from the point of engineering view based on material science. Also up-to-date topics will be lectured on material structure control and composite materials. Practices and repoprts will be imposed in each chapter to evaluate results of students. This subject is related to industrial problems.

Style〉 Lecture

Keyword〉 the study of failure, material structure control, environment-friendly composites

Relational Lecture〉 "Physical properties of materials"(0.3, ⇒56 page), "Theory of Plasticity and Application to Metal Forming Processes"(0.5, ⇒73 page)

Requirement〉 Students are required to be interested in materials and have the good understanding of material science in an undergraduate course.

Goal〉

1. To understand the structural control of materials
2. To understand the mechanics of composites and the benign technology for envirnment

Schedule〉

1. Introduction to the study of failure
2. Material engineering and ethics for engineers
3. Innovation of material processing toward environmentally benign society
4. Barrier-free processing and treatment of impurity elements
5. Construction of deformation process suppressing deteriorating effects of impurites in steel material
6. High-strain rate flexible forming of aluminum and magnesium alloys
7. Material structure control due to the thermomechanical treatment of steel materials
8. Up-to-date material structure control technology
9. Concept of composite materials
10. Characteristics of composite materials
11. Functions of composite materials
12. Rule of mixture (modulus of elasticity)
13. Rule of mixture (stress)
14. Environmental problem and recycle of composite material
15. Environment-friendly green composites
16. Regular test

Evaluation Criteria〉 Regular test result 100%

Textbook〉

◇ Not used (Yoshida).

◇ Will be introduced in the class (Takagi).

Reference〉 Will be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125151/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Yoshida (M619, +81-88-656-7358, yoshida@me.tokushima-u.ac.jp)Thursday and Friday, 17:00 to 18:00

⇒ Takagi (M620, +81-88-656-7359, takagi@me.tokushima-u.ac.jp)Friday 17:00-18:00

Fluids Energy Conversion Engineering

Professor · Junichiro Fukutomi, *Assistant Professor* · Masashi Ichimiya (2 units)

Target〉 This class introduces united interpretation and manipulation for principles which dominates characteristics of turbomachinery which transforms dynamical energy in fluids to mechanical work. This class also aims to understand dynamics of viscous fluid which is fundamental to utilize fluid energy.

Outline〉 1.Theoretical and experimental analysis method is introduced on flow condition of turbomachinery and its characteristic. 2.Dynamics of viscous fluid which is fundamental to utilize fluid energy is introduced. Lecture heads are as follows. (1) Outline of fluid energy conversion, (2) Internal flow and performance of centrifugal turbomachinery, (3) Internal flow and performance of axial turbomachinery, (4) Anomalous phenomena of the turbomachinery, (5) Nature of viscous fluid, (6) Equations of motion for viscous fluid

Style〉 Lecture

Keyword〉 Viscous fluid, Equation of motion, Energy conversion, Turbomachinery

Fundamental Lecture〉 "Strength of Materials 1"(0.5), "Fluid Dynamics 1"(1.0), "Fluid Dynamics 2"(1.0), "Fluid Machinery"(1.0)

Goal〉 1. To understand the principle which dominate the characteristic of turbomachinery 2. To understand dynamics of viscous fluid

Schedule〉

1. Nature of viscous fluid
2. Motion of viscous fluid
3. Difference between viscous and inviscid fluids, 1
4. Difference between viscous and inviscid fluids, 2
5. Similarity between viscous and inviscid fluids
6. Derivation of equations of motion for viscous fluid
7. Interpretation of equations of motion for viscous fluid
8. Examination for viscous fluid
9. Hydrodynamics of centrifugal and diagonal turbomachinery
10. Hydrodynamics of axial turbomachinery
11. Characteristics of turbocharger for automobile
12. Numerical simulation of internal flow
13. turbomachinery and noise
14. Anomalous phenomena of turbomachinery
15. One-dimensional flow of compressible fluid
16. Examination for turbomachinery

Evaluation Criteria〉 Examination for viscous fluid counts 50 points and examination for turbomachinery counts 50 points.

Textbook〉 Not used

Reference〉 Will be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125152/

Student〉 Able to be taken by student of other department

Contact〉

⇒ Fukutomi (M519, +81-88-656-7367, fukutomi@me.tokushima-u.ac.jp)
⇒ Ichimiya (M520, +81-88-656-7368, ichimiya@me.tokushima-u.ac.jp)

Advanced thermodynamics

Professor · Itsuki Morioka, *Associate Professor* · Masanori Kiyota (2 units)

Target〉 Quality of energy must be considered to promote effective utilization of energy as well as its quantity. Exergy is suitable for that purpose since it is based on the second law of thermodynamics. So understanding of exergy and its application to the practical systems are aimed to realize effective use of energy.The various refrigerators are compared concerning their perfomance and usage.

Outline〉 Exergy analysis is used to realize effective use of energy. Exergy is stated and its use is ilustrated by presenting some examples. Lecture items are 1)About exergy, 2)Exergy flow in the steam power plant, 3)Exergy of combustion process, 4)Exergy flow in the co-generation system. In the latter part, refrigeration cycles are detailed. Lecture items are listed below; (a) Theoretical refrigeration cycles, (b) Mechanism of actual machines and their operations, (c) Heat pumps.

Keyword〉 exergy, refrigeration cycle, heat pump

Requirement〉 The knowledge of engineering thermodynamics.

Goal〉

1. Aquiring ability to apply exergy analysis to actual energy systems
2. Obtaining deeper understanding of entropy through examples of exeregy analysis
3. To understand various refrigeration cysles and Undersdanding various refrigeration cycles and actual machines

Schedule〉

1. About exergy
2. Consevation of exergy
3. Calcuration of exergy
4. Exergy flow of steam power plant
5. Second law analysis of combustion process
6. Exergy of fuel
7. Exergy flow of co-generation systems (1)
8. Exergy flow of co-generation systems (2)
9. Theoretical refrigeration cycles, theme for report
10. Absorption refrigeration cycle, theme for report
11. Vapor compression rerigeration cycle , theme for report
12. Components of refrigeration machines of vapor compression type, theme of report
13. Operation of refrigeration machines of vapor compression type part 1, theme of report
14. Operation of refrigeration machines of vapor compression type part 2, theme of report
15. Heat pumps as energy saving equipments, theme of report
16. Final test

Evaluation Criteria〉 Scores of reports and final test are used at a rate of 6 to 4.

Textbook〉 Manuscripts prepared by the lecturer

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125153/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Morioka (M521, +81-88-656-7373, morioka@me.tokushima-u.ac.jp)Tuesday 17:00-18:00
⇒ Kiyota (M522, +81-88-656-7374, kiyota@me.tokushima-u.ac.jp)Friday 17:00-18:00

Advanced Heat Transfer

Professor · Akiharu Ousaka, *Research Associate* · Koji Kusano (2 units)

Target〉 This class introduces the two- and three-dimensional steady-state heat conduction problems, a number of heat transfer problems in either periodic or transient temperature variations and phase change problem.

Outline〉 The key problem of heat transfer is to determine the rate of heat transfer at a specified temperature difference to estimate the cost, the feasibility and the size of equipment necessary to transfer a specified amount of heat in a given time. In this class, following the two- and three-dimensional steady-state heat conduction problems, a number of heat transfer problems in either periodic or transient temperature variations and phase change problem are explained.

Style〉 Lecture and excercise

Keyword〉 Multidimensional steady-state heat conduction, Periodic heat conduction, Heat transfer with phase change

Requirement〉 Students are required to have a good understanding of undergraduate-level thermodynamics , hydrodynamics and related subjects.

Goal〉 To understand the solution of multidimensional steady-state heat conduction and heat transfer with phase change problems.

Schedule〉

1. Recent topics on heat transfer
2. Multidimensional steady-state heat conduction problem (1)
3. Multidimensional steady-state heat conduction problem (2)
4. Quasi-steady-state heat conduction problem (1)
5. Quasi-steady-state heat conduction problem (2)
6. Unsteady-state heat conduction problem (1)
7. Unsteady-state heat conduction problem (2)
8. Unsteady-state heat conduction problem (3)
9. Boundary layer theory in laminar flow (1)
10. Boundary layer theory in laminar flow (2)
11. Boundary layer theory in laminar flow (3)
12. Heat transfer problem with phase change (1)
13. Heat transfer problem with phase change (2)
14. Heat transfer problem with phase change (3)
15. Heat transfer problem with phase change (4)

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125154/

Student〉 Able to be taken by only specified class(es)

System Design

Professor · Katsunobu Konishi, *Associate Professor* · Kenichi Okada (2 units)

Target〉 This class introduces some representative methods for problem formulation and control system design.

Outline〉 System design is a process in which scientific principles and engineering tools are used to produce a plan which satisfy a hunan need. In this lecture, the conceptual design method such as NM method, KJ method and brainstorming method for problem formulation, and the control system design method such as modeling, equations of motion, modal analysis, obserber and controller are explained.

Style〉 Lecture

Keyword〉 brainstoming method, NM method, KJ method, modeling, equations of motion, modal analysis, observer and controller

Fundamental Lecture〉 "Digital Control Theory"(1.0, ⇒70 page)

Relational Lecture〉 "Advanced Applied Dynamics of Machine"(0.5, ⇒54 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level design engineering and automatic control theory.

Goal〉

1. To understand the outline of the system design.
2. To understand the data structuralizing method.
3. To understand the modeling method for control.
4. To understand the vibration control method.

Schedule〉

1. Outline of system design(1)
2. Outline of system design(2)
3. Data collection
4. Data Analysis
5. Structured design
6. Thinking pattern(1)
7. Thinking pattern(2)
8. Intermediate examination
9. Modeling
10. Equations of motion(1)
11. Equations of motion(2)
12. Modal analysis
13. Vibration control(1)
14. Vibration control(2)
15. Simulation
16. Final examination

Evaluation Criteria〉 Evaluate based on two examinations and reports

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125155/

Student〉 開講コース学生のみ受講可能

Contact〉

⇒ Konishi (M423, +81-88-656-7383, konishi@me.tokushima-u.ac.jp)
⇒ Okada (M123, +81-88-656-7395, okada@me.tokushima-u.ac.jp)

Energy Conversion System

Associate Professor · Yoshiyuki Kidoguchi (2 units)

Target〉 To understand principle of energy conversion and to consider improvement of energy conversion technologies on the point of saving energy consumption and decreasing environmental damages

Outline〉 Lecture on principle of energy conversion and its application, and on combustion mechanism and technologies of reducing toxic emissions of combustion engines as examples of energy conversion systems. This subject is concerned with industry.

Style〉 Lecture

Keyword〉 Energy conversion, Environmental protection, Combustion, Energy resources, Toxic emissions

Requirement〉 None

Notice〉 None

Goal〉 To understand principle of energy conversion, environmental effect of energy conversion and present technologies of energy conversion, and to recognize the importance of improvement of energy conversion technologies against environmental protection

Schedule〉

1. Present energy problem
2. Energy resources
3. Fundamental of energy conversion
4. Energy conversion by combustion
5. Combustion chemistry
6. Combustion of gaseous fuels (1)
7. Combustion of gaseous fuels (2)
8. Combustion of liquid fuels (1)
9. Combustion of liquid fuels (2)
10. Formation of emissions originated by combustion
11. Present energy conversion technologies
12. Energy conversion and energy recirculation
13. Energy conversion and environmental problems (1)
14. Energy conversion and environmental problems (2)
15. Energy saving in energy conversion

Evaluation Criteria〉 Appraise the understanding of the content of the lecture by setting some reports

Textbook〉 Yukio Mizutani, "Combustion Engineering"

Reference〉 None

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/miwa/index.html

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125156/

Student〉 Any students other than Ecosystem Engineering can attend this lecture.

Contact〉 Kidoguchi (Eco502, +81-88-656-9633, kidog@eco.tokushima-u.ac.jp)

Note〉 Need to submit some reports

Digital Control Theory

Professor · Katsunobu Konishi, *Assistant Professor* · Takuo Nagamachi (2 units)

Target〉 This class introduces the fundamental concept of digital control and neural network that can be used to design the optimal control systems based on the modern control theory.

Outline〉 In this lecture the fundamental conception of a digital control system and digital control strategies to apply the modern control theory is presented. In particular, two freedom control and a neural network is explained. The recent topics related to control engineering are also introduced.

Style〉 Lecture

Keyword〉 two freedom control, neural network, optimal control

Fundamental Lecture〉 "Automatic Control theory 1"(1.0), "Automatic Control theory 2"(1.0)

Relational Lecture〉 "Actuator Control Theory"(0.5, ⇒71 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level control theory and related subjects.

Goal〉

1. To understand the outline of the digital control.
2. To understand the applications of AI, neural network and fuzzy control

Schedule〉

1. Outline of digital control system
2. Difference of analog and digital control systems
3. Mathematical representation of control signal
4. Pulse transfer function
5. Stability and steady state deviation
6. Design of digital control system(PID)
7. Design of digital control system(two freedom control)
8. Design of digital control system(model prediction)
9. Intermediate examination
10. Outline of artificial intelligence
11. Exercise of artificial intelligence
12. Outline of neural network
13. Exercise of neural network
14. Outline of fuzzy theory
15. Exercise of fuzzy theory
16. Final examination

Evaluation Criteria〉 evaluate based on two examinations and reports.

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125157/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Konishi (M423, +81-88-656-7383, konishi@me.tokushima-u.ac.jp)

⇒ Nagamachi (M524, +81-88-656-9187, ngmch@me.tokushima-u.ac.jp)

Actuator Control Theory

Associate Professor · Kyoji Hashimoto (2 units)

Target〉 This class introduces the characteristics of actuators, the design methods of servo system.

Outline〉 The structure and function of actuators or control valves, the design of servo system, PWM control method, the practical and intelligent control algorithm are explained.

Style〉 Lecture

Keyword〉 actuator, servo system, control algorithm

Relational Lecture〉 "Digital Control Theory"(0.5, ⇒70 page), "Measurement Science and Technology"(0.5, ⇒72 page)

Requirement〉 Students are reqired to have a good understanding of undergraduate-level control engineering and related subjects.

Goal〉 To understand the design methods of servo system using actuators.

Schedule〉

1. Outline of actuators
2. Micro-drive electromotive actuators
3. Electromotive actuators
4. Novel actuators
5. Hydraulic actuators
6. Hydraulic control valves
7. Hydraulic servo system
8. Pneumatic actuators
9. Pneumatic control valves
10. Pneumatic servo system
11. PWM control method
12. Model matching methods
13. Neural controller
14. Two-degree-of-freedom control method
15. Model driven control method
16. Examination

Evaluation Criteria〉 Assignments count 30 % and examination count 70 %.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125158/

Student〉 Able to be taken by only specified class(es)

Contact〉 Hashimoto (M420, +81-88-656-7387, hasimoto@me.tokushima-u.ac.jp)

Measurement Science and Technology

Professor · Tetsuo Iwata, *Assistant Professor* · Hiroyuki Ukida (2 units)

Target〉 To understand importance of the Fourier transformation for developing various kinds of measurement techniues, measurement equipments, measurement systems.

Outline〉 Among the various measurement techniques used in the fundamental and applied research, optical measuremnt methods including their principles, methodologies, instrumentations, and evaluation methods are reviewed. In the lecture, emphasized is the importance of the concept of the Fourier transformation to understand and to deal with linear systems in the modern scientific measurement system. Practical methods of object inspections, distance measurements, and shape reconstructions using images are also lectured.

Style〉 Lecture

Keyword〉 measurement techniques, measurement devices, Fourier transform

Relational Lecture〉 "Micro-Nano Engineering"(0.5, ⇒76 page), "Digital Control Theory"(0.5, ⇒70 page), "Actuator Control Theory"(0.5, ⇒71 page)

Goal〉

1. 1. To understand Fourier series and Fourier transform.
2. 2. To understand relarions among Fourier transform and measurement principles of scientific instruments.
3. 3. To understand techniques used with practicable various mearurement devices.

Schedule〉

1. Frequency response of the amplifier
2. Optical information processing
3. Fourier-transform infrared spectoroscopy
4. Subfringe interferometry
5. Computed tomography
6. Sampling theorem and quantization theorem
7. Wavelet transformation
8. Lock-in amplifier and boxcar integrator
9. Optics for microscope
10. X-ray diffration
11. Image measurement systems
12. Feature extraction from images
13. Binocular stereo method
14. Pattern projection
15. Shape from shading and texture
16. Examination

Evaluation Criteria〉 Assignments count 50% and examinations count 50%.

Textbook〉 Printed synopses are used.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125159/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Iwata (M427, +81-88-656-9743, iwata@me.tokushima-u.ac.jp)
⇒ Ukida (M424, +81-88-656-9448, ukida@me.tokushima-u.ac.jp)

Theory of Plasticity and Application to Metal Forming Processes

Professor · Yoshinari Kaieda, *Associate Professor* · Yoshihiro Tada (2 units)

Target〉 This class introduce yield criteria of metals, plasticity theory and their application to metal forming processes.

Outline〉 Although metal forming techniques are diverse, the primary objective is to produce a desired shape change. The major concerns of the engineer are the forces required for the operations and the properties of the work materials. Engineering plasticity and its application to metal forming processes are introduced.

Style〉 Lecture

Keyword〉 yield theory, theory of plasticity, compressibility, anisotropy

Relational Lecture〉 "Machine Tool and Nachining System"(0.5, ⇒74 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level plasticity and fundamentals of metal forming operations.

Goal〉

1. To understand yield theory and slab analysis.
2. To understand fundamentals of compressive and anisotropic plasticity theories.

Schedule〉

1. Basic concept of yielding
2. Plastic behavior of metals under high hydrostatic pressure
3. Stress tensor and strain
4. Stress-strain curve and coordinate transformation
5. Principal stresses, invariants of stresses and Mohr's stress circle
6. Sress deviator tensor
7. Loading/unloading and yield theory
8. Mid-term examination
9. Plastic working of compressive metals
10. Yield criteria of compressive materials
11. Constitutive equation of compressive materials
12. Analysis of plastic deformation of compressive materials
13. Mechanics of powder consolidation
14. Yield criteria of anisotropic materials
15. Constitutive equation of anisotropic materials
16. Examination

Evaluation Criteria〉 Assignments count 50% and examinations count 50%.

Textbook〉 Printed synopsises are used.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125160/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Yoshinari Kaieda, room:M-321,TEL:088-656-7379, e-mail:kaieda@me.tokushima-u.ac.jp
⇒ Yoshihiro Tada, room:M-319,TEL:088-656-7381, e-mail:tada@me.tokushima-u.ac.jp

Machine Tool and Nachining System

Associate Professor · Masahiro Masuda (2 units)

Target〉 The lecture aims at learning approach methods in the process of understanding the recent advances in various machining.

Outline〉 The target of machining is to obtain high accuracy, high efficiency, low cost and desirable environment. In order to approach these targets various kinds of machining technology, watching systems, measuring technology have been advanced in the machining factory. The lecture deals with the basic concept and problems when machining difficult to cut materials, micro drilling, high speed milling, ultra-precision cutting and so on, as giving many examples.

Keyword〉 machining tecnology, machining concept, tool failure

Relational Lecture〉 "Theory of Plasticity and Application to Metal Forming Processes"(0.5, ⇒73 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level mechanical engineering and related subjects.

Goal〉 To understand the trend and the basic concept of machining.

Schedule〉

1. Recent trend on machining
2. Tool materials and tool failure
3. Cutting technology of various difficult to cut materials
4. High speed milling
5. Deep boring and drilling
6. Micro drilling
7. Electro discharge drilling applied ultrasonic waves
8. Ultra-precision cutting
9. Creep feed drinding
10. Machining for desirable envelonment
11. Watching system for machining
12. Quality engineering
13. Example (1) of quality engineering
14. Example (2) of quality engineering
15. Example (3) of quality engineering

Evaluation Criteria〉 Assignment for quality engineering (40%) and test (60%)

Textbook〉 None

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125161/

Contact〉 Masuda (M320, +81-88-656-7380, masuda@me.tokushima-u.ac.jp)

Precision Machinery

Professor · Takao Hanabusa (2 units)

Target〉 Learning of preparation and evaluation methods on thin films which are important to micro-machines and electronic parts.

Outline〉 We learn about basics of thin films, thin film preparation methods, crystal structure and stress in thin films. Since the development of residual stresses is a serious problem in thin film preparation, an evaluation and a control of the residual stresses are necessary in the fabrication of thin films. X-ray stress measurement and its application on the stress in thin films are to be understood. Recent works on stresses in thin films are introduced.

Requirement〉 To master a basic concept of crysital

Notice〉 To learn by yourself thin film preparation, crystallography, X-ray diffraction, X-ray stress measurement, micromachine and so on

Goal〉

1. Understanding of thin film preparation
2. Understanding of X-ray stress measurement
3. Understanding of stresses in thin films

Schedule〉

1. Basics of thin film
2. Thin film preparation
3. Crystal structure and stress in thin films
4. Mechanical stress measurement of thin film
5. X-ray diffraction (1) Characteristics of X-rays
6. X-ray diffraction (2) Crystal structures
7. X-ray diffraction (3) Diffraction by an atom and a small crystal
8. X-ray diffraction (4) Powder diffraction
9. Report and presentation
10. Principle of X-ray stress measurement
11. Stress measurement of thn films
12. Development of residual stress
13. Recovery of residual stress
14. Thermal stress and stress migration
15. Application of thin films
16. Examination

Evaluation Criteria〉 Report & presentation 40%, examination 60%

Textbook〉 None

Reference〉

- ◇ B. D. Cullity, Elements of X-ray Diffraction, Addison-Wesley
- ◇ K. Wetzig and C. M. Schneider (Eds.), Metal Based Thin Films For Electronics, Wiley-VCH

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125162/

Student〉 Able to be taken by only specified class(es)

Contact〉 Hanabusa(M317, 656-7377, hanabusa@me.tokushima-u.ac.jp)

Micro-Nano Engineering

Professor · , Associate Professor · (2 units)

Target〉 This class introduces the fundamentals of micro-nano engineering.

Outline〉 Basics of micro-nano engineering for the beginners.

Requirement〉 Students are required to have a good understanding of under-graduate level physics and related subjects.

Goal〉 To understand the fundamentals of micro-nano engineering

Schedule〉

1. Basics of micro-nano engineering
2. Various micro-nano process and photo-induced process
3. Laser Oscillation
4. Laser devices and properties
5. Basics of laser micro-nano engineering
6. Micro thermal process by lasers 1
7. Micro thermal process by lasers 2
8. Ultra-fast laser processing
9. Basics of MEMS
10. Micro actuators
11. Inkjet technologies 1
12. Inkjet technologies 2
13. Precision microfabrication for biotechnologies
14. Process monitoring in micro-nano processing
15. Precision microfabrication in industry
16. Examination

Evaluation Criteria〉 Assignments counts 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125163/

Seminar on Mechanical Engineering

Teacher of course (4 units)

Target〉 To obtain deeper knowledge and presentation abilities by reading scientific papers concerning mechanical engineering related to each Master's thesis.

Outline〉 In order to complete each Master's thesis, to read and to understand scientific papers and to make a discussion with an instructor.

Keyword〉 Master's thesis, Mechanical engineering

Goal〉 To obtain abilities to read scientific papers concerning each Master's thesis and to make a presentation.

Schedule〉

1. To read ten scientific papers concerning each Master's thesis and to make a presentation.
2. To read five scientific papers concerning mechanical engineering and to make a presentation.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125166/

Student〉 Able to be taken by only specified class(es)

Exercise on Mechanical Engineering

Teacher of course (2 units)

Target〉 To obtain sufficient knowledge and information required for completing each Master's thesis and to make a discussion with an instructor.

Outline〉 To read scientific papers on Master's thesis and to make a presentation under the direction of each laboratory's instructor.

Keyword〉 Master's thesis, Mechanical engineering

Goal〉 To obtain knowledge and information concerning each Master's thesis.

Schedule〉

1. To make a research on a problem concerning each Master's thesis and to make a presentation.
2. To discuss and to make a presentation on each Master's thesis.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125167/

Student〉 Able to be taken by only specified class(es)

Mechanical Engineering Labolatory

Teacher of course (6 units)

Target〉 To obtain comprehensive abilities for completing each Master's thesis through some related experiments.

Outline〉 To carry out some experiments concerning each Master's thesis.

Keyword〉 Master's thesis, Mechanical Engineering

Goal〉 To make a plan and to carry out experiments and to make a discussion on the results.

Schedule〉

1. Under the direction of the instructor, to make a plan and to carry out the experiment required for completing a Master's thesis.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125168/

Student〉 Able to be taken by only specified class(es)

Intelligent Structures and Mechanics Systems Engineering — Mechanical Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Management of Technology ..... WEB page, CMS
  - Presentation Method (M) ..... WEB page, CMS
  - Internship (M) ..... WEB page, CMS
  - Venture Business (M) ..... WEB page, CMS
- *Common Subjects*
  - Applied Fluid Dynamics ..... WEB page, CMS
  - Advanced Applied Dynamics of Machine ..... WEB page, CMS
  - Advanced Fracture and Structural Mechanics ..... WEB page, CMS
  - Physical properties of materials ..... WEB page, CMS
  - Project Management ..... WEB page, CMS
- *Basic Departmental Subjects*
  - Quantum mechanics and advanced lecture in quantum physics ..... WEB page, CMS
  - Superconductivity and superconducting materials ..... WEB page, CMS
  - Advanced Computational Science ..... WEB page, CMS
  - Methods for analysis of mathematical phenomena ..... WEB page, CMS
  - Solid State Ionics ..... WEB page, CMS
- *Applied Departmental Subjects*
  - Solid Mechanics ..... WEB page, CMS
  - Material Engineering ..... WEB page, CMS
  - Fluids Energy Conversion Engineering ..... WEB page, CMS
  - Advanced thermodynamics ..... WEB page, CMS
  - Advanced Heat Transfer ..... WEB page, CMS
  - System Design ..... WEB page, CMS
  - Energy Conversion System ..... WEB page, CMS
  - Digital Control Theory ..... WEB page, CMS
  - Actuator Control Theory ..... WEB page, CMS
  - Measurement Science and Technology ..... WEB page, CMS
  - Theory of Plasticity and Application to Metal Forming Processes ..... WEB page, CMS
  - Machine Tool and Nachining System ..... WEB page, CMS
  - Precision Machinery ..... WEB page, CMS
  - Micro-Nano Engineering ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Seminar on Mechanical Engineering ..... WEB page, CMS
  - Exercise on Mechanical Engineering ..... WEB page, CMS
  - Mechanical Engineering Labolatory ..... WEB page, CMS

Earth and Life Environmental Engineering

Earth and Life Environmental Engineering — Chemical Science and Technology
Syllabus of subjects

List of Subjects

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125105/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125106/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Management of Technology

Associate Professor · Tatsuya Deguchi (2 units)

Target〉 About the production management of the automobile industry, it is understood variously from the point of view such as ”research and development”, ”production management”, ”purchasing” and ”quality control” ”marketing” and ”cross-cultural management”.

Outline〉 It learns about the production management. This time, ”the automobile industry” specially takes up the production management of ”Honda Motor Co.,Ltd. (following Honda)” even of that in the case, and the class to appreciate that importance with ranking of technology in management is taken.

Requirement〉 Finish ” Introduction to new business ” or ” Advanced Lecture in management Theory of new business ” .

Notice〉 Face a class when a taking lecture person surely does enough preparation every time. And moreover, be the worst, but one person one time is to do some remarks every time.

Goal〉

1. The elementary knowledge of management is learned.
2. Ranking of the technology in management and that importance are appreciated.
3. It learns how to solve the various problems which always occur in the spot of the management through the case study and the business game.

Schedule〉

1. Guidance
2. Lecture ”What in Management of Technology?”
3. Case report ”Rsearch and development of Honda”
4. Case study ”Plan an overseas factory.” ”A new car development order”
5. Lecture ” Production management and purchasing”
6. Lecture ”Quality control”
7. Case report ”The production management of Honda”,”The supply chain management of Honda”
8. Case study ”Plan an overseas factory.”
9. Case report ”The quality control of Honda”
10. Case study ”Don't make material defects flare up again.”
11. Lecture ”Marketing strategy”
12. Lecture ”Cross-cultural management”
13. Case report ”Around the products project of Honda - the two-wheeled vehicle ”
14. Case report ”The path of internationalization of Honda”
15. Case report ”The personnel management of Honda”
16. Summary and questions and answers

Evaluation Criteria〉 It is evaluated in the remark (20%) in class and the middle, end of a term report (80% in total).

Textbook〉 It doesn't specially use.The summary and so on is distributed every time.

Reference〉 Several are introduced in class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125107/

Student〉 The person who finished ”Introduction to new business” or ” Advanced Lecture in management Theory of new business “ in all the students enrolled in the doctor former term course. And, the number of taking lecture people is restricted to do intensive learning. (20-25 people will be made an upper limit.) It is selected with some means in case of a taking lecture person many.

Note〉 This class invites seven Honda alumnuni who did work in ”research and development”, ”production management”, ”purchasing”, ”quality control”, ”marketing” , ”cross-culutural management”, and so on as an instructor, and it is the class to do case report. Even if it is seen nationwide, the trial done like this is very rare, and it is a precious class. And, an applicant for taking lecture is to attend it in the guidance to hold it in advance.A schedule is indicated separately.

Presentation Method (M)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125108/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (M)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal.
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125109/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (M)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125110/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Advanced Environmental Technology on Chemistry

Professor · Junko Motonaka, Katsuhiro Tamura, Shigeru Sugiyama, *Associate Professor* · Masahiro Katoh (2 units)

Target〉 The present situation and subjects on chemistry in view of environmental pollution will be introduced. Recent development in chemistry to attempt to solve those subjects will be explained.

Outline〉 Based on the historical background on environmental pollution, the recent progress on analytical chmistry, biochmistry, catalysis and chemical process engineering for environmental protection will be explained. The presentation on environmental subjects by students will be required.

Style〉 Lecture and excercise

Keyword〉 environment, analytical chemistry, biochemistry, catalyst, chemical process

Fundamental Lecture〉 "Advanced Analytical and Environmental Chemistry"(1.0, ⇒103 page), "Advanced Physical Chemistry"(1.0, ⇒101 page), "Advanced Materials Science"(1.0, ⇒106 page)

Relational Lecture〉 "Engineering of Biological Environment"(0.5, ⇒90 page), "Advanced Environmental Systems Engineering"(0.5, ⇒91 page)

Requirement〉 Requires undergraduate level knowlwdge of chemistry and chemical engineering.

Goal〉

1. To understand the present situation for environmental subjects on engineering (lectures from 1st to 5th, 14th and 15th)..
2. To develop ability for solving the environmental subjects (lectures from 6th to 15th).

Schedule〉

1. Histroty on environmental problems (1): Pollution
2. Histroty on environmental problems (2): Approach to solve the problems
3. Histroty on environmental problems (3): Recent technology
4. Recent situation on environmental technology (1): New problems on pollution
5. Recent situation on environmental technology (2): Recent development of technology
6. Approach from analytical chemistry (1)
7. Approach from analytical chemistry (2)
8. Approach from biochemistry (1)
9. Approach from biochemistry (2)
10. Approach from catalysis (1)
11. Approach from catalysis (2)
12. Approach from chemical process engineering (1)
13. Approach from chemical process engineering (2)
14. Presentation (1)
15. Presentation (2). Submission of the report on the present course will be required.

Evaluation Criteria〉 Assignments count 100% mainly based on the presentation and report submitted.

Textbook〉 To be announced in the class.

Reference〉 To be announced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125115/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Motonaka (G611, +81-88-656-7409, motonaka@chem.tokushima-u.ac.jp)
⇒ Tamura (G509, +81-88-656-7416, tamura@chem.tokushima-u.ac.jp)
⇒ Sugiyama (G309, +81-88-656-7432, sugiyama@chem.tokushima-u.ac.jp)
⇒ Katoh (M304, +81-88-656-7429, katoh@chem.tokushima-u.ac.jp)

Engineering of Biological Environment

Professor · Sumihare Noji, Hiroki Kourai, *Associate Professor* · Haruhiko Sakuraba, *Professor* · Akihiko Tsuji, Yoshinori Matsuo (2 units)

Target〉 To understand recent studies on engineering of biological environment

Outline〉 Advanced lectures for recent studies on engineering of biological environment

Style〉 Lecture

Keyword〉 Environment, Biology, Engineering

Requirement〉 N/A

Notice〉 N/A

Goal〉

1. Ecological environment
2. Biological environment
3. Methods for engineering for regulation of biological environment

Schedule〉

1. General concepts of enviromental engineering
2. Environmental ecology
3. Biological roles in environment
4. Roles of the true fungi in environment
5. Roles of the bacteria
6. Roles of the insects in environment
7. Roles of the birds in environment
8. Roles of the mammals in environment
9. Reports
10. Physical controls of biological environment
11. Chemical controls of biological environment
12. Biological controls of environment
13. Molecular designs of reagents for environment
14. Environmental hormones and chiemical pollutions and ethics
15. Recent topics for environmental engineering
16. Final Reports

Evaluation Criteria〉 Evaluation of Reports

Textbook〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125116/

Contact〉 Noji (G803, +81-88-656-7528, noji@bio.tokushima-u.ac.jp)Monday 15:30-17:00

Advanced Environmental Systems Engineering

Professor · Shuichi Hashimoto, *Associate Professor* · Yasunori Kozuki, Shoichiro Fujisawa, *Professor* · Hitoshi Murakami, Osamu Sueda, Akio Kondo, Kei Miwa
Associate Professor · Yoshiyuki Kidoguchi, Shigeki Matsuo, Yoshinobu Hirose (2 units)

Target〉 To understand the present environmental problems and to acquire the advanced of the technique and the approach to solve problems on the point of the ecosystem engineering.

Outline〉 To explain the structure and function of environmental systems, the relationship between civil life and disaster prevention systems, and the changes of social system due to the technological revolution and the policy.

Style〉 Lecture

Keyword〉 environmental policy, natural disaster, energy saving technology, welfare technology, miromechanical engineering

Goal〉

1. To understand the factor of environmental systems
2. To understand the strucure of environmental systems
3. To understand the civil life and natural disaster prevention systems

Schedule〉

1. The policy and natural disaster prevention measures (1)
2. The policy and natural disaster prevention measures (2)
3. The factor of environmental systems
4. Example of environmental systems
5. The structure of environmental systems
6. Example of structure of environmental systems
7. Civil life and nano-technology 1
8. Civil life and nano-technology 2
9. Midterm presentation
10. Well being technology 1
11. Well being technology 2
12. Ecosystem engineering 1
13. Ecosystem engineering 2
14. Hydrogen engine technology
15. Diesel engine engineering

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in th class

Reference〉 To be introduced in th class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125117/

Contact〉 Kozuki (Eco505, +81-88-656-7335, kozuki@eco.tokushima-u.ac.jp)

Quantum mechanics and advanced lecture in quantum physics

Associate Professor · Yoshitaka Michihiro (2 units)

Target〉 This class introduces the quantum mechanics.

Outline〉 Basics of quantum mechanics are introduced.

Style〉 Lecture

Goal〉 To understand the outline of quantum mechanics.

Schedule〉

1. Introduction
2. Variation
3. Lagrangian
4. Hamiltonian
5. The principles of quantum mechanics (1) Operator
6. The principles of quantum mechanics (2) Wavefunction
7. The principles of quantum mechanics (3) Expectation value
8. The principles of quantum mechanics (4) Schrödinger equation
9. Example (1) the square well potential
10. Example (2) the linear harmonic oscillator
11. Example (3) hydrogen atom
12. The principles of quantum mechanics (5) Heisenberg equation
13. Many-body problem
14. Field quantization
15. Phonon

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125170/

Contact〉 Yoshitaka Michihiro (A203)

Differential Equations

Associate Professor · Nobuyoshi Fukagai (2 units)

Target〉 Introduction to mathematical theory of differential equations.

Outline〉 Boundary value problems of second order linear differential equations.

Style〉 Lecture

Keyword〉 微分方程式の境界値問題, Sturm-Liouville 問題

Goal〉 To be familiar with Sturm-Louville type equations.

Schedule〉

1. Introduction
2. Helmholtz's equation
3. Eigenvalues and eigenfunctions
4. Green's function
5. Residue analysis
6. Expansion of Green's function
7. Fourier series
8. Existence theorem
9. Sturm-Liouville problems
10. Characteristic function
11. Solvability of boundary value problems
12. Basic estimates
13. Distribution of eigenvalues
14. Eigenfunction expansion
15. Review

Reference〉 望月清 · トルシン 『数理物理の微分方程式』 培風館

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125171/

Student〉 Able to be taken by student of other department

Contact〉 工学部数学教室 (A 棟 219 室)

Advanced applied analysis

Assistant Professor · Kuniya Okamoto (2 units)

Target〉 To learn the functional analytic methods which are basic tools for mathematical sciences.

Outline〉 This subject provides basic theory of functional analysis which is considered as linear algebra in infinite-dimensional spaces. Functional analytic approaches to phenomena described by differential equations are introduced.

Goal〉 To apply the theory of modern analysis and recognize its significant role.

Schedule〉

1. Introduction (What is functional analysis?)
2. Linear operators on finite-dimensional linear spaces
3. Eigenvalue problems
4. Matrix exponentials
5. Hilbert spaces, Banach spaces
6. Function spaces
7. Linear operators in infinite-dimensional linear spaces
8. Spectral resolutions
9. Fourier transforms
10. Operational calculus
11. Integral transforms, Resolvent operators
12. Strongly continuous semigroups
13. Abstract Cauchy problems
14. Applications to partial differential equations
15. Summary

Evaluation Criteria〉 Evaluation by the report.

Webpage〉 http://math9.pm.tokushima-u.ac.jp/lecture/

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125172/

Contact〉 岡本 (A212 室, TEL/FAX: 656-9441, E-mail: okamoto@pm.tokushima-u.ac.jp)

Topics of Analysis for Mathematical Science

Associate Professor · Atsuhito Kohda (2 units)

Target〉 Mathematical theory and technique for analysis of engineering phenomena

Outline〉 Mathematical theory to analyze problems in engineering and its application, mainly theory and technique of differential equations

Style〉 Lecture

Relational Lecture〉 "Advanced applied analysis"(0.2, ⇒22 page), "Differential Equations"(0.2, ⇒19 page)

Requirement〉 If you like undergraduate-level mathematics, it will be sufficient.

Goal〉 To be familiar with mathematical theory, that helps engineering study.

Schedule〉

1. Introduction to basic modern mathematics 1
2. Introduction to basic modern mathematics 2
3. Linearity and nonlinearity
4. Representation formula and existence of solutions 1
5. Representation formula and existence of solutions 2
6. Representation formula and existence of solutions 3
7. Behavior of solutions and problems of engineering 1
8. Behavior of solutions and problems of engineering 2
9. Solutions and spaces of functions 1
10. Solutions and spaces of functions 2
11. Solutions and spaces of functions 3
12. Topics of modern analysis 1
13. Topics of modern analysis 2
14. Mathematics and computer
15. Summary

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125173/

Contact〉 Kohda (A211, +81-88-656-7546, kohda@pm.tokushima-u.ac.jp)

Nuclear magnetic resonance

Professor · Takashi Ohno (2 units)

Target〉 This lecture explains principles of NMR and introduces applications to solid stste physics and chemistry.

Outline〉 Nuclear magnetic moment and its interaction with an external magnetic field are explained based on quantum mechanics. Some examples of its application to solid state physics and chemistry are introduced.

Style〉 Lecture

Keyword〉 Nuclear magnetic resonance, spectrum, spin - lattice relaxation, Knight shift, chemical shift

Schedule〉

1. magnetic moment of nuclei and Boltzmann's distribution
2. magnetic moment of electron
3. method for NMR obserbation
4. apparatus for NMR measurement
5. spin echop and spectrum
6. spin - lattice relaxation rate
7. NMR in metals
8. high Tc superconductors
9. NMR / NQR in high Tc superconductors
10. chemical shift
11. Knight shift
12. NMR in chemistry
13. magnetism and NMR
14. NMR / NQR in superconductors
15. NMR in super ionic conductors

Textbook〉 遍歴電子系の核磁気共鳴 (朝山邦輔著，裳華房)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125174/

Contact〉 Takashi Ohno (A201, 656-7549)

Solid State Ionics

Assistant Professor · Koichi Nakamura (2 units)

Target〉 This class introduces topics in solid state ionics, conduction mechanism in ionic conductors and techniques to study solid state ionics.

Outline〉 Basic experimental and theoretical approaches to understand solid state ionics are introduced and discussed in terms of "ion dynamic".

Keyword〉 Ionic conductor, Ionic diffusion, Secondary battery

Goal〉

1. To understand basic physical and chemical properties of ionic conductors.
2. To understand basic technique to study ionic conductors.

Schedule〉

1. Introduction to solid state ionics
2. Band theory and conduction mechanism
3. Defect in Ionic crystal
4. Diffusion in solid
5. Diffusion mechanism in solid
6. Solid electrolyte
7. Mixed conductor
8. Electrical conductivity
9. Application - Ion secondary battery -
10. Application - Fuel cell -
11. Electrical conductivity measurement
12. Nuclear Magnetic Resonance
13. Ultrasonic measurement
14. Recent topics on solid state ionics
15. Future in solid state ionics
16. Test

Evaluation Criteria〉 期末試験で評価する.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125175/

Contact〉 Nakamura (A216, +81-88-656-7577, koichi@pm.tokushima-u.ac.jp)

Advanced Materials Design

Professor · Yasuhiko Kawamura, *Associate Professor* · Keiji Minagawa (2 units)

Target〉 To understand functions and design of various soft materials in relation to the molecular structure and properties.

Outline〉 This class introduces structures, properties, and functions of various soft materials including functional polymers.

Style〉 Lecture

Keyword〉 Soft Matter, Functional Polymer, Properties of Polymers

Goal〉

1. To understand properties and functions of soft materials, especially polymers, in relation to the molecular structure.
2. To understand methods of molecular and material design for obtaining desired function.
3. To research and present topics related to functional polymers.

Schedule〉

1. Introduction to softl materials
2. Structure of polymers 1
3. Structure of polymers 2
4. Properties of polymes 1
5. Properties of polymes 2
6. Functional polymers 1
7. Functional polymers 2
8. Hydrophilic polymers and hydrogels
9. Colloids
10. Amphiphilic molecules
11. Liquid crystals
12. Topics 1
13. Topics 2
14. Topics 3
15. Topics 4
16. Summary

Evaluation Criteria〉 Assignments count 100%.

Reference〉 Ian W. Hamley, Introduction to Soft Matter, John Wiley & Sons, New York, 2000

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125176/

Contact〉 Minagawa (G612, +81-88-656-9153, minagawa@chem.tokushima-u.ac.jp)

Advanced Organic Chemistry

Professor · Yasuhiko Kawamura (2 units)

Target〉 This lecture intends to reconstruct knowledge of basic organic chemistry in view of structure and reactivity aspects and thus, aims at grasping essence shown in the real organic chemistry journals.

Outline〉 We wish to discuss 1) an advanced nomenclature of complicated organic molecules and chemistry informatics, 2) stereochemistry, 3) logical synthesis of organic molecules, and finally, 4) physical influence on organic reactions.

Style〉 Lecture

Keyword〉 Nomenclature, Stereochemistry, C-C Bond formation, Multistep synthesis, Physical influence

Fundamental Lecture〉 "Organic Chemistry"(1.0), "Synthetic Organic Chemistry"(1.0), "Fundamentals of Organic Reaction Mechanisms"(1.0)

Relational Lecture〉 "Advanced Topics in Synthetic Chemistry"(0.5, ⇒107 page)

Goal〉

1. Understanding essence of organic chemistry journals.
2. Ability to suggest or propose the way to solve various organic chemistry subjects.

Schedule〉

1. Nomenclature of complicated organic molecules 1: Bridged cyclic and ring-fused hydrocarbons
2. Nomenclature of complicated organic molecules 2: Heterocyclic compounds
3. Chemistry informatics
4. Stereochemistry 1: Terminology and definition
5. Stereochemistry 2: Optical rotation and resolution, asymmetric synthesis
6. Functional group preparation 1: Carboxylic acids and their derivatives
7. Functional group preparation 2: Aldehydes and ketones, alcohols and ethers
8. Functional group preparation 3: Alkyl halides, amines. isocyanates, etc.
9. C-C Bond formation 1: Nucleophilic and electrophilic reactions, carbanions, and enolates
10. C-C Bond formation 2: Cycloaddition reactions
11. C-C Bond formation 3: Recent advances
12. Multistep synthesis 1: Retrosynthetic analysis and application
13. Multistep synthesis 2: Annelation reactions; Report on an example of the recent organic synthesis
14. Reaction mechanism and prediction: Reaction rates, Eyring and Hammett equations
15. Physical influence on organic reactions
16. Final exam.

Evaluation Criteria〉 Students are credited by the results of evaluation of their reports (50%) and scores of the final exam (50%).

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125177/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kawamura (410 Chem Bldg, +81-88-656-7401, kawamura@chem.tokushima-u.ac.jp)

Advanced Topics in Polymerization Reactions

Associate Professor · Makiko Seno, *Assistant Professor* · Tomohiro Hirano (2 units)

Target〉 The purpose of this class is to understand the principles and mechanisms of polymer syntheses.

Outline〉 The mechanisms and kinetics in radical, ionic, coordination, group-transfer, ring-opening, polyaddition, and polycondensation polymerizations will be explained. Living ionic, metathesis, stereospecific, and asymmetric polymerizations will be introduced as precise polymerizations.

Style〉 Lecture

Keyword〉 radical polymerization, ionic polymerization, living polymerization, coordination polymerization, stereospecific polymerization

Fundamental Lecture〉 "Polymer Chemistry"(1.0), "Functional Polymer Design"(1.0)

Relational Lecture〉 "Advanced Organic Chemistry"(0.5, ⇒99 page)

Requirement〉 Requires undergraduate level knowlwdge of chemistry.

Goal〉

1. To understand the principles of polymer syntheses.
2. To understand relationship between monomer structure and reactivity in polymerization reaction.

Schedule〉

1. classification of polymerization reaction.
2. radical polymerization - kinetics
3. radical polymerization - initiators
4. radical polymerization - initiating reaction
5. radical polymerization - propagating reaction
6. radical polymerization - chain transfer and terminating reactions
7. living radical polymerization
8. novel polymerization reactions via radical mechanism
9. cationic polymerization
10. living cationic polymerization
11. anionic polymerization
12. living anionic polymerization
13. coordination polymerization
14. coordination polymerization
15. polyaddition polymerization
16. condensation polymerization

Evaluation Criteria〉 Assignment counts 100% mainly based on the report submitted.

Textbook〉 To be announced in the class.

Reference〉 To be announced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125178/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Seno (G408, +81-88-656-7404, seno@chem.tokushima-u.ac.jp)
⇒ Hirano (G405, +81-88-656-7403, hirano@chem.tokushima-u.ac.jp)

Advanced Physical Chemistry

Professor · Katsuhiro Tamura, *Associate Professor* · Yasuhiro Uosaki, *Assistant Professor* · Yoshihisa Suzuki (2 units)

Target〉 The main goal of this class is to understand the relationship between the principle of physical chemistry and real phenomena. Solvation, crystal growth, phase transition of lipid bilayer (as the model of biomembrane) and bioassay of pollutant are the main topics of this class.

Outline〉 (Solvation phenomena) Many chemical reactions are studied in liquids. Although solvation process plays a key role in these reactions, it is hard to understand the solvation quantitatively. In this lecture, "solvation thermodynamics" based on statistical mechanics is introduced and the methods to understand the solvation theoretically are explained. (Crystal Growth) Concepts and technology of crystal growth play an important role in design of materials and structure analysis. The main goal of this class is to provide a solid introduction to the fundamentals of crystal growth that can be used to describe various phenomena involving equilibrium conditions, rate processes, surface or interface properties, etc. (Phase transition and bioassay of pollutant) The physical properties of various micelles (normal and reversed micelles) and liposomal membranes are discussed. The chemical reactions including bioreactions in such molecular assemblies are also mentioned. Calorimetry and high-pressure techniques to study these chemical and physical phenomena are lectured from the viewpoint of basic and applied fields (for instance bioassay of pollutant).

Style〉 Lecture

Keyword〉 Solvation, crystal growth, Biomembrane, Bioassay

Fundamental Lecture〉 "Basic Physical Chemistry"(1.0), "Physico-chemical Excercise 1"(1.0), "Biophysical Chemistry"(1.0), "Physico-chemical Properties of Fluids"(1.0)

Relational Lecture〉 "Advanced Topics in Materials Science"(0.5, ⇒108 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level physical chemistry and related subjects.

Goal〉

1. To understand the fundamentals of solvation phenomena
2. To understand the fundamentals of crystal growth
3. To understand the outline of molecular assemblies and the fundamentals of thermal analysis
4. To understand bioassay as an analytical method for pollutant

Schedule〉

1. Statistical mechanics and thermodynamics
2. Chemical potential
3. Solvation thermodynamics
4. Solvation energy
5. Ion solvation
6. Thermodynamics of phase transition
7. Nucleation
8. Ideal growth rate of crystal
9. Surface structure and roughning transition
10. Surface kinetics
11. Physical properties of associated micelles and chemical reactions in the micelle.
12. Basis of calorimetry and calorimetry in biochemistry
13. Measurement of bioactivities and growth thermograms of microorganisms
14. Application of calorimetry to the measurements of pollutant
15. Bioassay of gas by using a gas pressurizing method

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be announced in the class

Reference〉 Yukio Saito, Statistical Physics of Crystal Growth, World Scientific, Singapore, 1996

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125179/

Student〉 Able to be taken by only specified class(es)

Contact〉 Tamura (G509, +81-88-656-7416, tamura@chem.tokushima-u.ac.jp)

Advanced Electrochemistry

Professor · Eiji Kanezaki, *Associate Professor* · Hiroshi Matsui (2 units)

Target〉 Molecular science based quantum chemistry minded for current topics will be present both in experimental and theoretical fields with emphasis on molecular spectroscopy in relation to molecular structure and molecular properties

Outline〉 Studies on electronic states of molecule are discussed from aspects of molecular spectroscopy under outer stresses of electric, magnetic and of optical forces to molecules or molecular assemblies. Although discussion will be focused onto the resonace condition of the forces, their double resonance will be included if time is not pressed

Style〉 Lecture

Keyword〉 molucular spectrocsopy

Fundamental Lecture〉 "Graduate Seminar in Chemical Science and Technology"(1.0, ⇒110 page), "Advanced experiments on chemical science and technology"(1.0, ⇒111 page)

Relational Lecture〉 "Graduate Seminar in Chemical Science and Technology"(0.5, ⇒110 page), "Advanced experiments on chemical science and technology"(0.5, ⇒111 page)

Goal〉 To understand, at least, one of the current topics in quantum chemistry

Schedule〉

1. plan of lecture
2. molecular spectroscopy
3. molecular spectroscopy
4. molecular spectroscopy
5. molecular spectroscopy
6. electronic states of molecules
7. electronic states of molecules
8. electronic states of molecules
9. electronic states of molecules
10. electronic states of molecules
11. interaction of molecules with outer fields
12. interaction of molecules with outer fields
13. interaction of molecules with outer fields
14. interaction of molecules with outer fields
15. interaction of molecules with outer fields
16. examination

Textbook〉 not specified

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125180/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kanezaki (G516, +81-88-656-9444, kanezaki@chem.tokushima-u.ac.jp)refer to the official HP

Advanced Analytical and Environmental Chemistry

Professor · Junko Motonaka, *Associate Professor* · Mikito Yasuzawa, *Assistant Professor* · Tomoki Yabutani (2 units)

Target〉 Lecture the current advance of analytical chemistry and earth environmental problem from e viewpoint of analytical chemistry to understand.

Outline〉 Outline the histry and advance of analytical chemistry and environmental pollution. Lecture the sampling and preparation, separation method and after treatment method, analytical method with photon, analytical method with electron, analytical method with ion, chemical sensor, environmental pollution and nalytical method of environmental analysis.

Style〉 Lecture

Keyword〉 Analytical Chemistry, environmental analytical chemistry

Goal〉

1. Understand of the current advance of analytical chemistry.
2. Understand of the earth environmental problem.

Schedule〉

1. Introduction
2. Histry and advance of analytical chemistry
3. Sampling and preparation
4. Separation method and after treatment method
5. Analytical method with photon
6. Analytical method with electron
7. Analytical method with ion
8. Chemical Sensor
9. Environmental pollution
10. Environmental pollution
11. Analytical method of environmental analysis
12. Analytical method of environmental analysis
13. Conclusion
14. Test

Evaluation Criteria〉 Evaluate of approach to the lecture(40%) and test(60%)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125181/

Advanced Chemical Reaction Engineering

Professor · Katsuhiro Kawashiro, *Assistant Professor* · Ken-Ichiro Sotowa (2 units)

Target〉 This class introduces chemical reactor design and optimization techniques that can be used for determing the optimal design and operating conditions of chemical processes.

Outline〉 Basics of chemical reactor and process design and operation will be introduced using a chemical reaction process as an example.

Style〉 Lecture

Keyword〉 reactors, process design, optimization, reaction engineering

Fundamental Lecture〉 "Differential Equations"(0.2, ⇒93 page), "Chemical Reaction Engineering"(0.8), "Quantum mechanics and advanced lecture in quantum physics"(0.4, ⇒92 page)

Relational Lecture〉 "Advanced Materials Science"(0.2, ⇒106 page), "Advanced Separation Technology"(0.2, ⇒105 page)

Requirement〉 Students are required to have a good understanding of chemical engineering and related subjects in an undergraduate course.

Goal〉

1. To understand the outline of chemical reactor and process design.
2. To understand several basic optimization techniqes for chemical processes.

Schedule〉

1. Single ideal reactors
2. Design for single reactors 1
3. Design for single reactors 2
4. Design for multiple reactions 1
5. Design for multiple reactions 2
6. Nonideal flow reactor 2
7. Nonideal flow reactor 2
8. Introduction to opmization problem
9. Linear programming
10. Nonlinear programming
11. Steepest descent method and line search
12. Integer programming problem
13. pinch technology
14. Process design exercise
15. Recent topics on process optimization

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125182/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Kawashiro (G308, +81-88-656-7431, kawasiro@chem.tokushima-u.ac.jp)
⇒ Sotowa (Chemistry and biotechnology building, 307., +81-88-656-4440, sotowa@chem.tokushima-u.ac.jp)16:00-17:00, Monday and Tuesday. (can be contacted whenever available)

Advanced Separation Technology

Professor · Tahei Tomida, *Associate Professor* · Masahiro Katoh (2 units)

Target〉 The purpose of this class is to understand typical separation processes, the concepts and mathematical treatments for mass transfer.

Outline〉 Separations are prominent in manufacture of chemicals, pharmaceuticals, metals etc. Various separation methods have been developed in chemical industry. Separations are also needed for treatment of hazardous wastes and for pollution control, especially for recycle and recovery of resources. The following types of systems will be discussed: principal of various separation methods, fundamentals of mass transfer, separation with phase change, gas absorption with chemical reactions, extraction, adsorption and ion exchange, membrane separation, methods of continuous separation. Mathematical treatments will include methods of characteristics and moment analysis. To facilitate understanding and practical application, a practice or a report will be also imposed on every item.

Style〉 Lecture

Keyword〉 mass transfer, separation processes

Goal〉

1. To understand several separation processes
2. To understand mathematical treatments for mass transfer

Schedule〉

1. Several separation processes and the concepts
2. Mass transfer
3. Gas absorption, steady analysis
4. Gas absorption, unsteady analysis
5. Gas absorption with chemical reaction
6. Gas absorption apparatuses
7. Adsorption equilibrium
8. Adsorption velocity and diffusion
9. Chromatography
10. Moment analysis
11. The principle of membrane separation
12. Membrane permeability
13. Separation process using hollow fiber
14. Continuous separation process
15. Test

Evaluation Criteria〉 Evaluate of approach to the lecture(40%) and test(60%).

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125183/

Contact〉

⇒ Tomida (G312, +81-88-656-7425, tomida@chem.tokushima-u.ac.jp)
⇒ Katoh (M304, +81-88-656-7429, katoh@chem.tokushima-u.ac.jp)

Advanced Materials Science

Professor · Shigeru Sugiyama, *Associate Professor* · Toshihiro Moriga (2 units)

Target〉 The purpose of this class is to understand the basic concepts of group theory and the most up-to-date analytical procedures, which are necessary in developing new material science.

Outline〉 The fundamentals of group theory for understanding the physical properties of materials based on the crystal (molecular) symmetry will be introduced. The recent analytical techniques on catalysts such as XAFS and solid state NMR will be explained.

Style〉 Lecture

Keyword〉 point group, group theory, catalyst, XAFS, solid state NMR

Fundamental Lecture〉 "Nuclear magnetic resonance"(1.0, ⇒96 page), "Solid State Ionics"(1.0, ⇒97 page), "Material Science"(1.0)

Relational Lecture〉 "Advanced Chemical Reaction Engineering"(0.5, ⇒104 page), "Advanced Environmental Technology on Chemistry"(0.5, ⇒89 page)

Requirement〉 Requires undergraduate level knowlwdge of chemistry.

Notice〉 Submission of exercise or report will be requested in the lectures from the 1st to 7th.

Goal〉

1. To understand the basis of group theory in the lectures from 1st to 7th.
2. To understand the advanced analytical procedure such as XAFS and NMR in the lectures from 8th to 15th.

Schedule〉

1. Point group, Stereographic projection, Symmetry operation (1)
2. Point group, Stereographic projection, Symmetry operation (2)
3. Introduction to group theory, Multiplication table, Subgroup and cyclic group
4. Representation, Similarity transformation and class
5. Reducible and irreducible representations, Character table
6. Great orthogonality theorem, Direct product
7. Projection operator, Case study
8. XAFS (1): Introduction
9. XAFS (2): Transmission mode
10. XAFS (3): Fluorescence mode
11. XAFS (4): Case study
12. Solid state NMR (1): Introduction
13. Solid state NMR (2): MAS
14. Solid state NMR (3): CP MAS
15. Solid state NMR (4): Case study. Submission of the report on the present course will be requested.

Evaluation Criteria〉 Assignment counts 100% mainly based on the report submitted.

Textbook〉 To be announced in the class.

Reference〉 To be announced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125184/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Sugiyama (G309, +81-88-656-7432, sugiyama@chem.tokushima-u.ac.jp)
⇒ Moriga (M603, +81-88-656-7423, moriga@chem.tokushima-u.ac.jp)Monday 4:30pm—5:30pm for 1st semester, Thursday 4:30pm—5:30pm for 2nd semester

Advanced Topics in Synthetic Chemistry

Part-time Lecturer (1 unit)

Target〉 To learn recent research topics on organic and synthetic chemistry.

Outline〉 Recent topics in reaction and syntheses in organic, organometallic, biomimetic, inorganic, and polymer chemistries.

Style〉 Lecture

Keyword〉 organic chemistry, synthetic chemistry

Fundamental Lecture〉 "Organic Chemistry"(1.0), "Molecular Design in Chemistry"(1.0), "Synthetic Organic Chemistry"(1.0)

Relational Lecture〉 "Advanced Organic Chemistry"(0.5, ⇒99 page), "Advanced Topics in Polymerization Reactions"(0.5, ⇒100 page), "Advanced Materials Design"(0.5, ⇒98 page)

Goal〉 To be able to explain the importance and breakghrough in the research area.

Evaluation Criteria〉 To be annouced by the lecturer in the class.

Textbook〉 To be accounced in the class.

Reference〉 To be announced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127940/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kawamura (410 Chem Bldg, +81-88-656-7401, kawamura@chem.tokushima-u.ac.jp)

Advanced Topics in Materials Science

Part-time Lecturer (1 unit)

Target〉 To learn recent research topics on materials science

Outline〉 Basic theories of physical and chemical properties, and structure of materials will be lectured by an lecturer from other research institutions.

Style〉 Lecture

Keyword〉 material, properties, chemical structure

Fundamental Lecture〉 "Physical Chemistry"(1.0), "Inorganic Chemistry"(1.0)

Relational Lecture〉 "Advanced Physical Chemistry"(0.5, ⇒101 page), "Advanced Analytical and Environmental Chemistry"(0.5, ⇒103 page), "Advanced Electrochemistry"(0.5, ⇒102 page)

Goal〉 To be able to explain the importance and breakthrough in the research area

Schedule〉

1. To be annouced by the lecturer

Evaluation Criteria〉 To be announced by the lecturer in the class.

Textbook〉 To be announced by the lecturer

Reference〉 To be announced by the lecturer

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127941/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kanezaki (G516, +81-88-656-9444, kanezaki@chem.tokushima-u.ac.jp)

Advanced Topics in Chemical Process Engineering

Part-time Lecturer (1 unit)

Target〉 To learn recent topics on chemical process engineering.

Outline〉 Recent trends in chemical engineering, process design and development will be explained by a lecturer from other research institutions.

Style〉 Lecture

Keyword〉 chemical engineering, process engineering

Fundamental Lecture〉 "Chemical Engineering Principles"(1.0), "Chemical Reaction Engineering"(1.0), "Separation Science and Technology"(1.0), "Material Science"(1.0)

Relational Lecture〉 "Advanced Chemical Reaction Engineering"(0.5, ⇒104 page), "Advanced Materials Science"(0.5, ⇒106 page), "Advanced Separation Technology"(0.5, ⇒105 page)

Goal〉 To be able to explain the importance and breakthrough in the research area.

Schedule〉

1. To be announced by the lecturer in the class

Evaluation Criteria〉 To be announced by the lecturer

Textbook〉 To be announced by the lecturer

Reference〉 To be announced by the lecturer

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127942/

Student〉 Able to be taken by only specified class(es)

Contact〉 Sugiyama (G309, +81-88-656-7432, sugiyama@chem.tokushima-u.ac.jp)

Graduate Seminar in Chemical Science and Technology

Teacher of course (4 units)

Target〉 To improve the skills in reading academic papers and in making presentation.

Outline〉 The students will read some academic papers and make presentation on the context. Through the presentation and discussion, the students will improve the skill in making presentations and learn how the research results can be applied to the industry.

Style〉 Lecture in combination with Portfolio

Keyword〉 discussion, literature, presentation

Fundamental Lecture〉 "Undergraduate Work"(1.0), "Seminar on Chemical Science and Technology"(1.0)

Relational Lecture〉 "Advanced experiments on chemical science and technology"(0.5, ⇒111 page)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125188/

Advanced experiments on chemical science and technology

Teacher of course (8 units)

Target〉 To learn how to conduct a research as an independent researcher

Outline〉 Students will conduct a research work related to the master's thesis, and acquire a broader knowledge of engineering.

Keyword〉 research, thesis

Fundamental Lecture〉 "Undergraduate Work"(1.0), "Seminar on Chemical Science and Technology"(1.0)

Relational Lecture〉 "Graduate Seminar in Chemical Science and Technology"(0.5, ⇒110 page)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125189/

Earth and Life Environmental Engineering — Chemical Science and Technology
Web page and CMS related subject

- *Integrated Subjects*
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Management of Technology ..... WEB page, CMS
  - Presentation Method (M) ..... WEB page, CMS
  - Internship (M) ..... WEB page, CMS
  - Venture Business (M) ..... WEB page, CMS
- *Common Subjects*
  - Advanced Environmental Technology on Chemistry ..... WEB page, CMS
  - Engineering of Biological Environment ..... WEB page, CMS
  - Advanced Environmental Systems Engineering ..... WEB page, CMS
- *Basic Departmental Subjects*
  - Quantum mechanics and advanced lecture in quantum physics ..... WEB page, CMS
  - Differential Equations ..... WEB page, CMS
  - Advanced applied analysis ..... WEB page, CMS
  - Topics of Analysis for Mathematical Science ..... WEB page, CMS
- *Applied Departmental Subjects*
  - Nuclear magnetic resonance ..... WEB page, CMS
  - Solid State Ionics ..... WEB page, CMS
  - Advanced Materials Design ..... WEB page, CMS
  - Advanced Organic Chemistry ..... WEB page, CMS
  - Advanced Topics in Polymerization Reactions ..... WEB page, CMS
  - Advanced Physical Chemistry ..... WEB page, CMS
  - Advanced Electrochemistry ..... WEB page, CMS
  - Advanced Analytical and Environmental Chemistry ..... WEB page, CMS
  - Advanced Chemical Reaction Engineering ..... WEB page, CMS
  - Advanced Separation Technology ..... WEB page, CMS
  - Advanced Materials Science ..... WEB page, CMS
  - Advanced Topics in Synthetic Chemistry ..... WEB page, CMS
  - Advanced Topics in Materials Science ..... WEB page, CMS
  - Advanced Topics in Chemical Process Engineering ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Graduate Seminar in Chemical Science and Technology ..... WEB page, CMS
  - Advanced experiments on chemical science and technology ..... WEB page, CMS

Earth and Life Environmental Engineering — Biological Science and Technology
Syllabus of subjects

List of Subjects

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125105/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125106/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Management of Technology

Associate Professor · Tatsuya Deguchi (2 units)

Target〉 About the production management of the automobile industry, it is understood variously from the point of view such as ”research and development”, ”production management”, ”purchasing” and ”quality control” ”marketing” and ”cross-cultural management”.

Outline〉 It learns about the production management. This time, ”the automobile industry” specially takes up the production management of ”Honda Motor Co.,Ltd. (following Honda)” even of that in the case, and the class to appreciate that importance with ranking of technology in management is taken.

Requirement〉 Finish ” Introduction to new business ” or ” Advanced Lecture in management Theory of new business ” .

Notice〉 Face a class when a taking lecture person surely does enough preparation every time. And moreover, be the worst, but one person one time is to do some remarks every time.

Goal〉

1. The elementary knowledge of management is learned.
2. Ranking of the technology in management and that importance are appreciated.
3. It learns how to solve the various problems which always occur in the spot of the management through the case study and the business game.

Schedule〉

1. Guidance
2. Lecture ”What in Management of Technology?”
3. Case report ”Rsearch and development of Honda”
4. Case study ”Plan an overseas factory.” ”A new car development order”
5. Lecture ” Production management and purchasing”
6. Lecture ”Quality control”
7. Case report ”The production management of Honda”,”The supply chain management of Honda”
8. Case study ”Plan an overseas factory.”
9. Case report ”The quality control of Honda”
10. Case study ”Don't make material defects flare up again.”
11. Lecture ”Marketing strategy”
12. Lecture ”Cross-cultural management”
13. Case report ”Around the products project of Honda - the two-wheeled vehicle ”
14. Case report ”The path of internationalization of Honda”
15. Case report ”The personnel management of Honda”
16. Summary and questions and answers

Evaluation Criteria〉 It is evaluated in the remark (20%) in class and the middle, end of a term report (80% in total).

Textbook〉 It doesn't specially use.The summary and so on is distributed every time.

Reference〉 Several are introduced in class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125107/

Student〉 The person who finished ”Introduction to new business” or ” Advanced Lecture in management Theory of new business “ in all the students enrolled in the doctor former term course. And, the number of taking lecture people is restricted to do intensive learning. (20-25 people will be made an upper limit.) It is selected with some means in case of a taking lecture person many.

Note〉 This class invites seven Honda alumnuni who did work in ”research and development”, ”production management”, ”purchasing”, ”quality control”, ”marketing” , ”cross-culutural management”, and so on as an instructor, and it is the class to do case report. Even if it is seen nationwide, the trial done like this is very rare, and it is a precious class. And, an applicant for taking lecture is to attend it in the guidance to hold it in advance.A schedule is indicated separately.

Presentation Method (M)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125108/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (M)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal.
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125109/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (M)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125110/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Advanced Environmental Technology on Chemistry

Professor · Junko Motonaka, Katsuhiro Tamura, Shigeru Sugiyama, *Associate Professor* · Masahiro Katoh (2 units)

Target〉 The present situation and subjects on chemistry in view of environmental pollution will be introduced. Recent development in chemistry to attempt to solve those subjects will be explained.

Outline〉 Based on the historical background on environmental pollution, the recent progress on analytical chmistry, biochmistry, catalysis and chemical process engineering for environmental protection will be explained. The presentation on environmental subjects by students will be required.

Style〉 Lecture and excercise

Keyword〉 environment, analytical chemistry, biochemistry, catalyst, chemical process

Fundamental Lecture〉 "Advanced Analytical and Environmental Chemistry"(1.0, ⇒103 page), "Advanced Physical Chemistry"(1.0, ⇒101 page), "Advanced Materials Science"(1.0, ⇒106 page)

Relational Lecture〉 "Engineering of Biological Environment"(0.5, ⇒121 page), "Advanced Environmental Systems Engineering"(0.5, ⇒122 page)

Requirement〉 Requires undergraduate level knowlwdge of chemistry and chemical engineering.

Goal〉

1. To understand the present situation for environmental subjects on engineering (lectures from 1st to 5th, 14th and 15th)..
2. To develop ability for solving the environmental subjects (lectures from 6th to 15th).

Schedule〉

1. Histroty on environmental problems (1): Pollution
2. Histroty on environmental problems (2): Approach to solve the problems
3. Histroty on environmental problems (3): Recent technology
4. Recent situation on environmental technology (1): New problems on pollution
5. Recent situation on environmental technology (2): Recent development of technology
6. Approach from analytical chemistry (1)
7. Approach from analytical chemistry (2)
8. Approach from biochemistry (1)
9. Approach from biochemistry (2)
10. Approach from catalysis (1)
11. Approach from catalysis (2)
12. Approach from chemical process engineering (1)
13. Approach from chemical process engineering (2)
14. Presentation (1)
15. Presentation (2). Submission of the report on the present course will be required.

Evaluation Criteria〉 Assignments count 100% mainly based on the presentation and report submitted.

Textbook〉 To be announced in the class.

Reference〉 To be announced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125115/

Student〉 Able to be taken by only specified class(es)

Contact〉

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⇒ Sugiyama (G309, +81-88-656-7432, sugiyama@chem.tokushima-u.ac.jp)
⇒ Katoh (M304, +81-88-656-7429, katoh@chem.tokushima-u.ac.jp)

Engineering of Biological Environment

Professor · Sumihare Noji, Hiroki Kourai, *Associate Professor* · Haruhiko Sakuraba, *Professor* · Akihiko Tsuji, Yoshinori Matsuo (2 units)

Target〉 To understand recent studies on engineering of biological environment

Outline〉 Advanced lectures for recent studies on engineering of biological environment

Style〉 Lecture

Keyword〉 Environment, Biology, Engineering

Requirement〉 N/A

Notice〉 N/A

Goal〉

1. Ecological environment
2. Biological environment
3. Methods for engineering for regulation of biological environment

Schedule〉

1. General concepts of enviromental engineering
2. Environmental ecology
3. Biological roles in environment
4. Roles of the true fungi in environment
5. Roles of the bacteria
6. Roles of the insects in environment
7. Roles of the birds in environment
8. Roles of the mammals in environment
9. Reports
10. Physical controls of biological environment
11. Chemical controls of biological environment
12. Biological controls of environment
13. Molecular designs of reagents for environment
14. Environmental hormones and chiemical pollutions and ethics
15. Recent topics for environmental engineering
16. Final Reports

Evaluation Criteria〉 Evaluation of Reports

Textbook〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125116/

Contact〉 Noji (G803, +81-88-656-7528, noji@bio.tokushima-u.ac.jp)Monday 15:30-17:00

Advanced Environmental Systems Engineering

Professor · Shuichi Hashimoto, *Associate Professor* · Yasunori Kozuki, Shoichiro Fujisawa, *Professor* · Hitoshi Murakami, Osamu Sueda, Akio Kondo, Kei Miwa
Associate Professor · Yoshiyuki Kidoguchi, Shigeki Matsuo, Yoshinobu Hirose (2 units)

Target〉 To understand the present environmental problems and to acquire the advanced of the technique and the approach to solve problems on the point of the ecosystem engineering.

Outline〉 To explain the structure and function of environmental systems, the relationship between civil life and disaster prevention systems, and the changes of social system due to the technological revolution and the policy.

Style〉 Lecture

Keyword〉 environmental policy, natural disaster, energy saving technology, welfare technology, miromechanical engineering

Goal〉

1. To understand the factor of environmental systems
2. To understand the strucure of environmental systems
3. To understand the civil life and natural disaster prevention systems

Schedule〉

1. The policy and natural disaster prevention measures (1)
2. The policy and natural disaster prevention measures (2)
3. The factor of environmental systems
4. Example of environmental systems
5. The structure of environmental systems
6. Example of structure of environmental systems
7. Civil life and nano-technology 1
8. Civil life and nano-technology 2
9. Midterm presentation
10. Well being technology 1
11. Well being technology 2
12. Ecosystem engineering 1
13. Ecosystem engineering 2
14. Hydrogen engine technology
15. Diesel engine engineering

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in th class

Reference〉 To be introduced in th class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125117/

Contact〉 Kozuki (Eco505, +81-88-656-7335, kozuki@eco.tokushima-u.ac.jp)

Quantum mechanics and advanced lecture in quantum physics

Associate Professor · Yoshitaka Michihiro (2 units)

Target〉 This class introduces the quantum mechanics.

Outline〉 Basics of quantum mechanics are introduced.

Style〉 Lecture

Goal〉 To understand the outline of quantum mechanics.

Schedule〉

1. Introduction
2. Variation
3. Lagrangian
4. Hamiltonian
5. The principles of quantum mechanics (1) Operator
6. The principles of quantum mechanics (2) Wavefunction
7. The principles of quantum mechanics (3) Expectation value
8. The principles of quantum mechanics (4) Schrödinger equation
9. Example (1) the square well potential
10. Example (2) the linear harmonic oscillator
11. Example (3) hydrogen atom
12. The principles of quantum mechanics (5) Heisenberg equation
13. Many-body problem
14. Field quantization
15. Phonon

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127938/

Contact〉 Yoshitaka Michihiro (A203)

Superconductivity and superconducting materials

Professor · Yutaka Kishimoto (2 units)

Target〉 To understand basics and recent developments in superconductivity.

Outline〉 This class reviews quantum mechanics and introduces superconductivity and recent superconducting materials.

Style〉 Lecture

Keyword〉 superconductivity, Cooper pair, superconducting energy gap, density of states, anisotropic superconductivity

Goal〉 To understand the outline of superconductivity.

Schedule〉

1. Introduction to superconductivity
2. Review of quantum mechanics (1), Schrödinger equation and wave function
3. Review of quantum mechanics (2), operators and expected values
4. Review of quantum mechanics (3), perturbation theory
5. Free electron model of metals
6. Phenomenological theory of superconductivity
7. To understand Meissner effect on the basis of quantum mechanics
8. Formation of Cooper pair
9. Formation of superconducting energy gap
10. Density of states, and energy gap at finite temperatures
11. Introduction to Nuclear Magnetic Resonance method
12. Frontier of superconductivity (1), strong coupling superconductor
13. Frontier of superconductivity (2), heavy Fermion superconductor
14. Frontier of superconductivity (3), copper oxide high Tc superconductor
15. Summary

Evaluation Criteria〉 Reports on several subjects in the class.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127937/

Contact〉 Yutaka Kishimoto (A202)

Advanced Computational Science

Professor · Toshiki Takeuchi (2 units)

Target〉 This class provides the basic technology for numerical calculation for the differential equation.

Outline〉 The numerical calculation methods for the differential equation are introduced.

Style〉 Lecture

Keyword〉 Numerical analysis, Numerical computation, Differential equation

Fundamental Lecture〉 "Numerical Analysis"(1.0), "Basic Mathematics"(1.0), "Basic Mathematics"(1.0)

Relational Lecture〉 "Methods for analysis of mathematical phenomena"(1.0, ⇒18 page), "Numerical Analysis"(1.0)

Requirement〉 Students have to understand basic mathematics of undergraduate-level.

Goal〉 To understand principle of numerical calculation methods.

Schedule〉

1. Introduction of numerical simulation
2. Mathematical model
3. Least squares method
4. Lagrange interpolation
5. Spline interpolation
6. Finite difference method
7. Arbitrary precision formula
8. Application to the 1-dimension differential equation
9. Application to the 2-dimension differential equation
10. Gauss-Seidel method
11. Successive Over-Relaxation method
12. Explicit method
13. Implicit method
14. Crank-Nicolson method
15. Numerical instabilities

Evaluation Criteria〉 Assignments count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127935/

Student〉 Able to be taken by only specified class(es)

Contact〉 Takeuchi (A206, +81-88-656-7544, takeuchi@pm.tokushima-u.ac.jp)

Methods for analysis of mathematical phenomena

Professor · Hitoshi Imai (2 units)

Target〉 To learn the to analyze the mathematical phenomena.

Outline〉 Methods used in analysis of mathematical phenomena are introduced. Especially, those in numerical analysis are focused on.

Style〉 Lecture

Keyword〉 Mathematics, Numerical, Analysis

Relational Lecture〉 "Advanced Computational Science"(0.5, ⇒125 page)

Requirement〉 Only the premise that have studied basic mathematics.

Goal〉 The adequacy of the two-dimensional boundary value problem governed by the Poisson equation can be understood by the finite difference method, etc.

Schedule〉

1. Introduction to computer
2. Common sense in numerical computation
3. High-speed computation (Parallel computing)
4. Finite difference method I
5. Finite difference method II
6. Finite difference method III
7. Finite difference method IV
8. Finite element method I
9. Finite element method II
10. Finite element method III
11. Finite element method IV
12. Boundary element method I
13. Boundary element method II
14. Boundary element method III
15. Spectral method

Evaluation Criteria〉 Evaluation by the report.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127934/

Contact〉 Imai(A220, +81-88-656-7541, The inquiry by means of the cellular phone or E-mail is not acceptable)Office hours: Thursday 14:00-15:00

Biochemical Thermodynamics

Professor · Shoji Kaneshina, *Associate Professor* · Hitoshi Matsuki (2 units)

Target〉 Thermodynamic treatments for molecular aggregates constructed by self-association of bio-related substances and effects of environmental variables such as temperature, pressure and additives on the aggregates are described.

Outline〉 The former part of this lecture reviews treatments for molecular aggregates such as monolayers, micelles and vesicles constructed by self-association of bio-related substances like surfactants, lipids and amphiphilic drugs from a thermodynamic viewpoint. The latter part describes various nature of these aggregates and structure changes of the aggregates by environmental variables such as temperature, pressure and additives. Further industrial application and utilization of molecular aggregates are also explained. This lecture deals with industrial subjects.

Style〉 Lecture

Keyword〉 Bio-related substance, Molecular aggregate, Thermodynamics, Phase behavior, Pressure

Fundamental Lecture〉 "Physical Chemistry 2"(1.0), "Biophysical Chemistry 2"(1.0)

Relational Lecture〉 "Advanced Biophysical Chemistry"(0.5, ⇒131 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level physical chemistry and biophysical chemistry and related subjects.

Goal〉

1. To understand the thermodynamic treatments of molecular aggregates formed by bio-related substances.
2. To understand the nature for aggregates of bio-related substances and effects of environmental variables on the aggregates.

Schedule〉

1. Thermodynamics of molecular aggregates (1) thermodynamics of adsorption at interfaces 1
2. Thermodynamics of molecular aggregates (2) thermodynamics of adsorption at interfaces 2
3. Thermodynamics of molecular aggregates (3) phase transitions of monolayers 1
4. Thermodynamics of molecular aggregates (4) phase transitions of monolayers 2
5. Thermodynamics of molecular aggregates (5) thermodynamics of self-association 1: phase separation model
6. Thermodynamics of molecular aggregates (6) thermodynamics of self-association 2: mass action model
7. Thermodynamics of molecular aggregates (7) micelle formation in dilute solutions 1
8. Thermodynamics of molecular aggregates (8) micelle formation in dilute solutions 2
9. Structures and functions of molecular aggregates (1) solution behavior 1: Krafft point
10. Structures and functions of molecular aggregates (2) solution behavior 2: cloud point
11. Structures and functions of molecular aggregates (3) phase behavior of bilayers 1
12. Structures and functions of molecular aggregates (4) phase behavior of bilayers 2
13. Structures and functions of molecular aggregates (5) pressure effect on bilayers 1
14. Structures and functions of molecular aggregates (6) pressure effect on bilayers 2
15. Structures and functions of molecular aggregates (7) phase behavior of bilayer mixtures: domain formation
16. Summary, inquiry and report preparations

Evaluation Criteria〉 More than 80% percentage of attendance and reports (100%).

Textbook〉 To be distributed materials adequately in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125191/

Student〉 Able to be taken by student of other department

Contact〉 Kaneshina (G607, +81-88-656-7513, kanesina@bio.tokushima-u.ac.jp)

Advanced Biochemistry

Associate Professor · Masami Nagahama, *Professor* · Akihiko Tsuji (2 units)

Target〉 This class introduces biological regulations by signal transduction in multicellular organisms.

Outline〉 Biological regulations involving enzymes, substrates, and other macromolecules are introduced. Molecular mechanisms of expression of biological activities are especially focused.

Style〉 Lecture

Keyword〉 signal transduction, signaling molecule, organelle

Fundamental Lecture〉 "Biochemistry 1"(1.0), "Cell Biology"(1.0)

Relational Lecture〉 "Advanced enzyme engineering"(0.5, ⇒137 page), "Biological macromolecular chemistry"(0.5, ⇒140 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level biochemistry.

Goal〉

1. Understanding of regulatory mechanism of synthesis and secretion of signaling molecules.
2. Understanding of signal transduction and its regulatory factors in cells.

Schedule〉

1. Cell structure and role of organelles
2. Experimental techniques for studies of regulation of signal transduction(1)
3. Experimental techniques for studies of regulation of signal transduction(2)
4. Synthesis of peptide signaling molecules
5. Post-translational modifications of signaling molecules(1)Addition and processing of carbohydrate chains
6. Post-translational modifications of signaling molecules(2)Processing of polypeptides
7. Post-translational modifications of signaling molecules(3)Processing proteases(1)
8. Post-translational modifications of signaling molecules(3)Processing proteases(2)
9. Regulation of secretion of signaling molecules
10. Quality control of signaling molecules(1)
11. Quality control of signaling molecules(2)
12. ER stress proteins and chaperones(1)
13. ER stress proteins and chaperones(2)
14. Development of new drugs targeting regulatory factors for signal transduction
15. Transcriptional regulation by ER stress proteins
16. Report preparation

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125192/

Student〉 Able to be taken by only specified class(es)

Contact〉 Nagahama (G712, +81-88-656-7523, nagahama@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Advanced Molecular Biology

Professor · Sumihare Noji, *Associate Professor* · Hideyo Ohuchi (2 units)

Target〉 To understand advanced technology for molecular biology

Outline〉 We will present recent topics on molecular biology and its applications for genetic engineering. 1) Molecular biology on insects and its applications (3), 2) Molecular biology on brain and neural systems (3), 3) Molecular biology on vetebrate development and its applications (4). 4) Molecular biology on human diseases (4).

Style〉 Lecture

Keyword〉 Signlalling pathways, Transcription factors, Genes and diseases

Relational Lecture〉 "Technology for Bioreaction"(0.5, ⇒138 page), "Advamced Cell Physiology"(0.5, ⇒132 page), "Advanced Biotechnology"(0.5, ⇒135 page)

Requirement〉 N/A

Notice〉 N/A

Goal〉 To understand molelcular mechanisms of development and diseases

Schedule〉

1. Molecular biology of insects, early development
2. Molecular biology of insects, late development
3. Molecular biology of insects, regeneration
4. Molecular biology of insects, brain development
5. Molecular biology of insects, neural development
6. Molecular biology of insects, mutations
7. Molecular biology of vertebrates, early development
8. Molecular biology of vertebrates, late development
9. report for evaluation
10. Molecular biology of vertebrates, brain and neural development
11. Molecular biology of vertebrates, regeneration
12. Molecular biology of human diseases, limbs
13. Molecular biology of human diseases, eyes
14. Molecular biology of human diseases, muscles
15. Molecular biology of human diseases, general
16. Final report for evaluation

Evaluation Criteria〉 Evaluate two reports (50% each)

Textbook〉 N/A

Reference〉 Handouts

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125193/

Student〉 all

Contact〉 Noji (G803, +81-88-656-7528, noji@bio.tokushima-u.ac.jp)Monday 15:30-17:00

Cell Biotechnology

Professor · Hideaki Nagamune, *Associate Professor* · Toshifumi Tomoyasu (2 units)

Target〉 This class aims to expand the knowledge on cell biotechnology and improve the skill of debate through the debate dealing with cell biotechnology and its applications.

Outline〉 Debates among students dealing with the latest reports on technology and application concerned with production of useful materials, medical assay, and medical treatment using various cells are held in order to deepen the knowledge on cell biotechnology and its peripheral field. Training on skills of debate and communication is simultaneously carried out.

Style〉 Lecture

Keyword〉 Cell, Biotechnology, debate

Relational Lecture〉 "Advanced Biochemistry"(0.8, ⇒128 page), "Advanced Molecular Biology"(0.8, ⇒129 page), "Technology for Bioreaction"(0.8, ⇒138 page), "Biological macromolecular chemistry"(0.5, ⇒140 page), "Advanced enzyme engineering"(0.5, ⇒137 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level of cell technology and related subjects

Goal〉

1. To understand the latest cell biotechnology and its application examples
2. To gain the ability of debate on technologies concerned in cell biotechnology

Schedule〉

1. Cell biotechnology on production of useful materials 1
2. Cell biotechnology on production of useful materials 2
3. Cell biotechnology on production of useful materials 3
4. Cell biotechnology on production of useful materials 4
5. Cell biotechnology on production of useful materials 5
6. Cell biotechnology on medical or industrial assay 1
7. Cell biotechnology on medical or industrial assay 2
8. Cell biotechnology on medical or industrial assay 3
9. Cell biotechnology on medical or industrial assay 4
10. Cell biotechnology on medical or industrial assay 5
11. Cell biotechnology on medical treatment 1
12. Cell biotechnology on medical treatment 2
13. Cell biotechnology on medical treatment 3
14. Cell biotechnology on medical treatment 4
15. Cell biotechnology on medical treatment 5
16. General Discussion

Evaluation Criteria〉 Assignments count 100%(Goal 1), Presentation/Discussion count 100%(Goal 2).

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125194/

Student〉 Able to be taken by student of other department

Contact〉 Nagamune (G707, +81-88-656-7525, nagamune@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Advanced Biophysical Chemistry

Associate Professor · Hitoshi Matsuki, *Professor* · Shoji Kaneshina (2 units)

Target〉 Treatments of solutions containing biomolecules and analytical methods for interactions between biomolecular aggregates and physiologically active substances by means of the treatments are described.

Outline〉 The former part of this lecture describes solutions in which biomolecules reveal their actions from the macroscopic, microscopic and electrochemical viewpoints. The latter part deals with ligand partitioning into lipid bilayer membranes as examples of interactions between molecular aggregates formed by biomolecules and physiologically active substances. The molecular mechanisms of anesthesia until now are reviewed on the basis of the above subjects. Further industrial application of the interactions such as drug delivery systems is also explained. This lecture deals with industrial subjects.

Style〉 Lecture

Keyword〉 Solution, Molecular aggregate, Ligand, Interaction, Mechanism of anesthesia

Fundamental Lecture〉 "Physical Chemistry 2"(1.0), "Biophysical Chemistry 2"(1.0)

Relational Lecture〉 "Biochemical Thermodynamics"(0.5, ⇒127 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level physical chemistry and biophysical chemistry and related subjects.

Goal〉

1. To understand the macroscopic, microscopic and electrochemical treatments of solutions.
2. To understand the partitioning modes of ligands into biomacromolecules and molecular mechanisms of anesthesia.

Schedule〉

1. Solution chemistry of bio-related substances (1) thermodynamics of solutions 1
2. Solution chemistry of bio-related substances (2) thermodynamics of solutions 2
3. Solution chemistry of bio-related substances (3) thermodynamics of solutions 3
4. Solution chemistry of bio-related substances (4) statistical thermodynamics of solutions 1
5. Solution chemistry of bio-related substances (5) statistical thermodynamics of solutions 2
6. Solution chemistry of bio-related substances (6) statistical thermodynamics of solutions 3
7. Solution chemistry of bio-related substances (7) electrochemistry of solutions 1
8. Solution chemistry of bio-related substances (8) electrochemistry of solutions 2
9. Interactions between biomacromolecules and physiologically active substances (1) ligand partitioning into lipid membranes 1
10. Interactions between biomacromolecules and physiologically active substances (2) ligand partitioning into lipid membranes 2
11. Interactions between biomacromolecules and physiologically active substances (3) effect of dissociation equilibrium of ligand
12. Interactions between biomacromolecules and physiologically active substances (4) mechanisms of anesthesia 1: introduction
13. Interactions between biomacromolecules and physiologically active substances (5) mechanisms of anesthesia 2: lipid membrane theories
14. Interactions between biomacromolecules and physiologically active substances (6) mechanisms of anesthesia 3: protein receptor theories
15. Interactions between biomacromolecules and physiologically active substances (7) action mechanisms of local anesthetics
16. Summary, inquiry and report preparations

Evaluation Criteria〉 More than 80% percentage of attendance and reports (100%).

Textbook〉 To be distributed materials adequately in the class.

Reference〉

- ◇ 本村欣士著「溶液化学」朝倉書店
- ◇ J. S. Rawlinson and F. L. Swinton "Liquids and Liquid Mixtures" Butterworths Scientific

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125195/

Student〉 Able to be taken by only specified class(es)

Contact〉 Matsuki (G609, +81-88-656-7520, matsuki@bio.tokushima-u.ac.jp)Friday 16:20-17:50

Advamced Cell Physiology

Associate Professor · Haruhiko Sakuraba (2 units)

Target〉 This class is intended to demonstrate how to use capable molecular viewers (Rasmol & PyMol) for protein structure, which can be used for detailed analyses of protein 3D-structure.

Outline〉 This class (portfolio) introduces how the programs (Rasmol & PyMol) can be used, and what their capabilities are.

Style〉 Portfolio

Keyword〉 Protein 3D-structure, Protein Data Bank, PyMol, Rasmol

Relational Lecture〉 "Biological macromolecular chemistry"(0.5, ⇒140 page)

Requirement〉 Students are required to bring note-type PC, if necessary (Windous is better).

Goal〉

1. To understand protein coordinate file.
2. To understand operation of molecular viewers.

Schedule〉

1. Protein Data Bank and coodinate file
2. Installation of the programs
3. Getting started with mouse controls
4. Getting started with commands
5. Comand syntax and atom selection 1
6. Comand syntax and atom selection 2
7. Ray-tracing and stereo
8. Animation
9. Tutorial 1
10. Tutorial 2
11. Tutorial 3
12. Exercise 1
13. Exercise 2
14. Exercise 3
15. Exercise 4

Evaluation Criteria〉 Drawing products with brief explanation (assignments count 100%)

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125196/

Student〉 Able to be taken by only specified class(es)

Contact〉 Sakuraba (M719, +81-88-656-7531, sakuraba@bio.tokushima-u.ac.jp)Friday 16:20-17:50

Advanced Microbiological Engineering

Professor · Hiroki Kourai (2 units)

Target〉 Acquire the fundamental and advanced microbiological engineering and fermentation technology

Outline〉 Target and summary of this class is to understand fermentation process of alcohol, lactic acid, amino acid, vitamin, nucleic acids, anibiotics and organic acids.

Style〉 Lecture

Keyword〉 fermentation, alcohol, amino acids

Fundamental Lecture〉 "Biomolecular Design"(0.4, ⇒134 page)

Relational Lecture〉 "Advanced enzyme engineering"(0.4, ⇒137 page)

Requirement〉 Students are required to have a good understanding of under graduate-level microbiology and related subjects.

Goal〉

1. To understand the outline of microbial engineering
2. To understand the outline of fermentation

Schedule〉

1. 1. Outline of microbial engineering.
2. 2. Outline of microbial engineering
3. 1. Fermentation process of Japanese sake
4. 2. Fermentation of Japanese sake
5. 1.Fermentation process of wine
6. 2.Fermentation process of wine
7. Fermentation process of beer
8. Fermentation process of whiskey
9. Fermentation process of lactic acid
10. Fermentation process of acetic acid
11. Fermentation process of amino acids
12. Fermentation process of antibiotics
13. Fermentation process of vitamin
14. Fermentation process of nucleic acids
15. Recent topics on fermentation process
16. Final Examination

Evaluation Criteria〉 Grading with final examination

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125197/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kourai (M813, +81-88-656-7408, kourai@bio.tokushima-u.ac.jp)Friday 16:20-17:20

Biomolecular Design

Professor · Hitoshi Hori, *Associate Professor* · Hideko Nagasawa (2 units)

Target〉 Conceptual and engineering-based strategic skills in molecular (functional) design, synthesis, and biological activities of biofunctional modifiers including physiologically active compounds and drugs.

Outline〉 Basics of biomolecular (functional) design of biofunctional modifiers including physiologically active compounds and drugs are introduced using the concept of molecular orbital.

Style〉 Lecture

Keyword〉 biomolecular functional design, molecular orbital theory

Relational Lecture〉 "Biological macromolecular chemistry"(0.5, ⇒140 page)

Goal〉

1. To understand the molecular orbital theory as a tool of an biomolecular design
2. To calculate the molecular orbitals of simple biofunctional modifiers to discuss their physical and biological properties quantitatively

Schedule〉

1.) Biomolecular (functional) design and the concept of molecular orbital
2. Enzymatic reaction and molecular orbital
3. Quantum theory-based atomic structure and molecular bonds
4. Molecular structures and the concept of hybridized orbitals. Subject review report-1
5. Heteroatom containing structures. Discussion on subject review report-1
6. Structures of intermediates. Subject review report-2
7. Molecular orbital calculation-1: localizedπ-bond. Discussion on subject review report-2
8. Molecular orbital calculation-2: localizedπ-bond. Subject review report-3
9.) Molecular orbital calculation-3: localizedπ-bond. Discussion on subject review report-3
10. Molecular orbital calculation-4: delocalizedπ-bond (butadiene)
11. Round-table discussion on subject review report-4
12. Molecular orbital calculation-5: delocalizedπ- bond (cyclobutadiene). Subject review report-5
13. Round table discussion on subject review report-5
14. Another biomolecular design concepts: scaffold or "Ken-zan", pharmacophores, isosteres
15. Round table discussion on subject review report-6
16. Round-table discussion on this class "biomolecular design"

Evaluation Criteria〉 Subject review reports (1-5) counts 100%.

Textbook〉 To be introduced before the opening day of the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125198/

Student〉 Able to be taken by student of other department

Contact〉 Hori (M821, +81-88-656-7514, hori@bio.tokushima-u.ac.jp)Monday 11:55-12:50

Advanced Biotechnology

Associate Professor · Hideaki Maseda (2 units)

Target〉 Acquire the fundamental, advanced and applied biotechnology

Outline〉 Target and summary of this class is to understand applied microbiology, ecology, bioinstrumentation, food biotechnology, waste management and environmental biotechnology.

Style〉 Lecture

Keyword〉 Applied microbiology, Food biotechnology, Environmental biotechnology

Fundamental Lecture〉 "Biomolecular Design"(0.4, ⇒134 page)

Relational Lecture〉 "Advanced enzyme engineering"(0.4, ⇒137 page)

Requirement〉 Students are required to have a good understanding of under graduate-level biotechnology and related subjects.

Goal〉

1. To understand the outline of biotechnology
2. To understand the outline of advanced biotechnology

Schedule〉

1. 1. Outline of microbial bioengineering
2. 2. Outline of microbial bioengineering
3. 1. Outline of biotechnology
4. 2. Outline of biotechnology
5. 1. Ecology
6. 2. Ecology
7. 1. Bioinstrumentation
8. 2. Bioinstrumentation
9. 1. Food biotechnology
10. 2. Food biotechnology
11. 3. Food biotechnology
12. 1. Waste management
13. 2. Waste management
14. 1. Environmental biotechnology
15. 2. Environmental biotechnology
16. Final Examination

Evaluation Criteria〉 Grading with final examination

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125199/

Student〉 Able to be taken by only specified class(es)

Contact〉 Maseda (M814, +81-88-656-7524,)Friday 16:20-17:50

Advanced Biomaterials

Associate Professor · Toshifumi Tomoyasu, *Professor* · Hideaki Nagamune (2 units)

Target〉 This class investigates about the new technology and the scientific background which produced it.

Outline〉 Students are required to investigate how the important discovery (which acquired the Nobel Prize as an example) were established and how improved our life and research activities by these accomplishments.

Style〉 Lecture

Keyword〉 Technology, Biomaterial, Research, Application

Requirement〉 Students are required to have a good understanding of undergraduate-level biochemistry and molecularbiology.

Goal〉

1. To understand how the important discoveries in the scientific field were performed.
2. To understand how the important discoveries are applied to our life and research.

Schedule〉

1. Orientation
2. The discovery of penicillin and its curative effect in various infectious diseases. A. Fleming, E. Chain, H. Florey
3. Discovery of tumour-inducing viruses. P. Rous
4. Interpretation of the genetic code and its function in protein synthesis. R. Holley , H. Khorana, M. Nirenberg
5. The discovery of restriction enzymes and their application to problems of molecular genetics. H. Smith, W. Arber
6. Contributions concerning the determination of base sequences in nucleic acids. W. Gilbert, F. Sanger
7. Theories concerning the specificity in development and control of the immune system and the discovery of the principle for production of monoclonal antibodies. N. Jerne, G. Kohler, C. Milstein
8. Discovery concerning reversible protein phosphorylation as a biological regulatory mechanism. E. Fischer, E. Krebs
9. Contributions to the developments of methods within DNA-based chemistry. K. Mullis, M. Smith
10. Discovery of Prions - a new biological principle of infection. S. Prusiner
11. The discovery that proteins have intrinsic signals that govern their transport and localization in the cell. G. Blobel
12. Discoveries concerning 'genetic regulation of organ development and programmed cell death'. S. Brenner, H. Horvitz, J. Sulston
13. The development of methods for identification and structure analyses of biological macromolecules. J. Fenn, K. Tanaka, K. Wüthrich
14. The discovery of ubiquitin-mediated protein degradation. A. Ciechanover, A. Hershko, I. Rose
15. Generalization of lectures

Evaluation Criteria〉 Require more than 80% of attendance to the lectures. Grades are judged by the reports about two attainment targets (100 points each), which are performed in every lecture. The student requires more than 60 points to a pass.

Textbook〉 To be introduce in the class.

Reference〉 To be introduce in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125200/

Student〉 Able to be taken by only specified class(es)

Contact〉 Tomoyasu (G701, +81-88-656-9213, tomoyasu@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Advanced enzyme engineering

Professor · Akihiko Tsuji, *Associate Professor* · Masami Nagahama (2 units)

Target〉 This class introduces engineering of enzyme molecule for the medical application.

Outline〉 Basics of design of enzyme and their inhibitor by chemical and gene technologies for medical application are introduced.

Style〉 Lecture

Keyword〉 Enzyme, Medical application, Protein engineering

Fundamental Lecture〉 "Biochemistry 1"(1.0), "Protein Engineering"(1.0)

Relational Lecture〉 "Advanced Biochemistry"(0.5, ⇒128 page), "Biomolecular Design"(0.5, ⇒134 page), "Advamced Cell Physiology"(0.3, ⇒132 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level biochemistry.

Goal〉

1. Understanding of enzyme character required for therapeutic use.
2. Understanding of design of enzyme molecule for therapeutic use.

Schedule〉

1. Introduction of medical application of enzyme
2. Basic of enzymology (1)
3. Basic of enzymology (2)
4. Therapeutic use of enzyme
5. Problem in therapeutic use of enzyme(1)Immunological problem
6. Problem in therapeutic use of enzyme(2)Drug delivery system.
7. Problem in therapeutic use of enzyme(3)Preparation of large quantity of enzyme
8. Example of design of enzyme for medical use (1)
9. Example of design of enzyme for medical use (2)
10. Example of engineered enzyme used for therapy of lysosome disease(1)
11. Example of engineered enzyme used for therapy of lysosome disease(2)
12. Application of PEG-modified enzyme (1)
13. Application of PEG-modified enzyme (2)
14. Target enzyme for development of new drug
15. Engineering of enzyme inhibitor
16. Report preparation

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125201/

Student〉 Able to be taken by student of other department

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Technology for Bioreaction

Professor · Sumihare Noji, *Associate Professor* · Hideyo Ohuchi (2 units)

Target〉 Lectures for science and technology to use biological reactions. Especially, focusing on morphological formation of organisms, we will talk about how genomic infomation is decoded to bilud up body by bottom-up strategies.

Outline〉 We present lelcutures about techynology for application of biological reactions, especially meidical and engineering applications. We will focuse on 1) genome projects, 2) application of genome information, 3) application of PCR to genetic analyses, 4) in situ hybridization for analysis of gene expression pattern, 5) application of in situ hybridization, 6) transgenic animals, 7) applications of transgenic animals, 8) knock-out animals, 9) applications of knock-out animals, 10) medical applications of knock-out animals

Style〉 Lecture

Keyword〉 genom sicence, RNA engineering, Technology for Developmental biology

Relational Lecture〉 "Advanced Molecular Biology"(0.5, ⇒129 page), "Advanced Molecular Biology"(0.5, ⇒129 page), "Advanced Biochemistry"(0.5, ⇒128 page)

Requirement〉 N/A

Notice〉 N/A

Goal〉

1. To understand structures of genomes and its analitical methods
2. To understand analytical methods for gene expression
3. To understand morpholigical genes and its structures
4. To understand mechanisms of developmenal process

Schedule〉

1. Evolution
2. Genomic structures and evolution
3. Transcription factors and gene expression
4. Cis-regulaory elements and regulation of gene expression
5. Gene expression patterns
6. Functions of RNAs
7. RNA interference
8. reports for evaluation
9. Homeobox genes
10. Genes for signalling pathways
11. Genes for cell-cell adhesion factors
12. Developmental mechanisms of C. elegance
13. Developmental mechanisms of insects
14. Developmental mechanisms of invertebrate
15. Developmental mechanisms of vertebrate
16. report for evaluation

Evaluation Criteria〉 Evaluate two reports (50% each).

Textbook〉 N/A

Reference〉 From DNA to Diversity

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125202/

Student〉 all students

Contact〉 Noji (G803, +81-88-656-7528, noji@bio.tokushima-u.ac.jp)Monday 15:30-17:00

Molecular Biotechnology

Teacher of course (2 units)

Target〉 The purpose of this lecture is to understand the recent progress on functions of useful enzymes for biotechnological applications.

Outline〉 Various kinds of enzymes are utilized forbioprocesses. In this lecture, enzymological properties of useful enzymes, the relationship between the stracture and function of useful enzymes, analysis of the enzymatic function based on genome information, inprovement of enzymes by point mutation and molecular evolution and application methods of enzymes are discussed.

Style〉 Lecture in combination with Portfolio

Keyword〉 Enzyme application, Enzyme reactor

Relational Lecture〉 "Advanced enzyme engineering"(0.5, ⇒137 page), "Advanced Biochemistry"(0.5, ⇒128 page), "Advamced Cell Physiology"(0.5, ⇒132 page)

Schedule〉

1. Screening methods for useful enzymes 1
2. Screening methods for useful enzymes 2
3. Production methods of useful enzymes 1
4. Production methods of useful enzymes 2
5. Purification strategy of useful enzymes
6. Physicochemical and biochemical analyses of useful enzymes 1
7. Physicochemical and biochemical analyses of useful enzymes 2
8. Presentation and discussion on probrems
9. Functional analysis of useful enzymes based on bioinformatics
10. Reaction mechanisms of enzymatic reactions
11. Relationships between 3D structure and function of enzymes 1
12. Relationships between 3D structure and function of enzymes 2
13. Improvement of useful enzymes by protein engineering
14. Industrial applications of enzymes 1
15. Industrial applications of enzymes 2
16. Presentation and discussion on probrems

Evaluation Criteria〉 Evaluation is carried out by report and discussion for problems related to the lecture..

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125203/

Student〉 Able to be taken by only specified class(es)

Contact〉 Administration Office(M703)

Biological macromolecular chemistry

Professor · Hitoshi Hori (2 units)

Target〉 The goal is to understand the structure and function of biological macromolecules from the perspective of molecular recognition and interaction.

Outline〉 How do biological macromolecules recognize the target molecule and function? An introduction to the basic structural biology and stereochemistry of biological macromolecules. Topics include protein and nucleic acid structure. Students should make presentations focusing the molecular recognition and interaction of biological macromolecules based on the PDB data and their recent scientific papers.

Style〉 Lecture

Keyword〉 molecular interaction, molecular recognition, protein data bank, molrecular modeling

Relational Lecture〉 "Advamced Cell Physiology"(0.5, ⇒132 page), "Biomolecular Design"(0.5, ⇒134 page)

Goal〉

1. To understand the principle of structure and function of biological macromolecule.
2. To understand the mechanisms of molecular recognition of biological macromolecule through PDB database search.

Schedule〉

1. Introduction to protein structure 1
2. Introduction to protein structure 2
3. Molecular recognition and interaction in protein-protein and protein- nucleic acid complex.
4. Molecular recognition and interaction in protein-small molecule complex.
5. How to retrieve the protein 3D structure from PDB database.
6. Molecular modeling of protein.
7. Molecular modeling of protein-small molecular complex.
8. Exercise 1
9. Exercise 2
10. Exercise 3
11. Presentation and discussion 1
12. Presentation and discussion 2
13. Presentation and discussion 3
14. Presentation and discussion 4
15. Presentation and discussion 5

Evaluation Criteria〉 Report 50% and presentation 50%

Textbook〉 To be introduced in the class

Reference〉

- ◇ To be introduced in the class
- ◇ Branden & Tooze "Introduction to protein structure" Garland

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125204/

Student〉 Able to be taken by student of other department

Contact〉 Hori (M821, +81-88-656-7514, hori@bio.tokushima-u.ac.jp)Monday 11:55-12:50

Practice for undrstanding scientific papers in bioogical technology

Teacher of course (2 units)

Target〉 To learn how to read scientific papers for research

Outline〉 In order to obtain information on research and to learn how to present research results, students read papers related to their subjects of master thesis, present its contents, and discuss about contents of the paper.

Style〉 Lecture and excercise

Keyword〉 Reading of papar, Oral presentation

Relational Lecture〉 "Seminar in Biological Technology"(0.5, ⇒142 page), "Biological science and technology laboratory"(0.5, ⇒143 page)

Requirement〉 N/A

Notice〉 N/A

Goal〉 To learn how to read papers

Schedule〉

1. presentation and discussion 1
2. presentation and discussion 2
3. presentation and discussion 3
4. presentation and discussion 4
5. presentation and discussion 5
6. presentation and discussion 6
7. presentation and discussion 7
8. presentation and discussion 8
9. presentation and discussion 9
10. presentation and discussion 10
11. presentation and discussion 11
12. presentation and discussion 12
13. presentation and discussion 13
14. presentation and discussion 14
15. presentation and discussion 15
16. presentation and discussion 16

Evaluation Criteria〉 Mutual evaluation of presentation

Textbook〉 N/A

Reference〉 Related papers

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125208/

Student〉 Able to be taken by only specified class(es)

Contact〉 Administration Office(M703)

Seminar in Biological Technology

Teacher of course (2 units)

Target〉 The goal of this lecture is to aquire the knowledge necessary for research related to the Master's thesis.

Outline〉 Student elevates the reaseach abillity and skill in the individual laboratory through presentation and active discussion as to the subject of study. In addition, industrial and medical applications of reseach reuslts should be required.

Style〉 Excercise

Keyword〉 Discussion for research work, Oral presentation

Relational Lecture〉 "生命テクノサイエンス研究論文"(0.5), "Biological science and technology laboratory"(0.5, ⇒143 page), "Practice for undrstanding scientific papers in bioogical technology"(0.5, ⇒141 page)

Requirement〉 N/A

Notice〉 N/A

Goal〉 To learn how to perform research

Schedule〉

1. Research presentation 1 and discussion
2. Research presentation 2 and discussion
3. Research presentation 3 and discussion
4. Research presentation 4 and discussion
5. Research presentation 5 and discussion
6. Research presentation 6 and discussion
7. Research presentation 7 and discussion
8. Research presentation 8 and discussion
9. Research presentation 9 and discussion
10. Research presentation 10 and discussion
11. Research presentation 11 and discussion
12. Research presentation 12 and discussion
13. Research presentation 13 and discussion
14. Research presentation 14 and discussion
15. Research presentation 15 and discussion
16. Research presentation 16 and discussion

Evaluation Criteria〉 Evaluate master thesis

Textbook〉 N/A

Reference〉 Research papers

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125209/

Student〉 Able to be taken by only specified class(es)

Contact〉 Administration Office(M703)

Biological science and technology laboratory

Teacher of course (10 units)

Target〉 According to the subject of study, student carriy out the research to obtain good ability and skill for reseach and for presntation.

Outline〉 Students carrry out each reseach according to the subject of study to elevate their reaseach abillity and skill in the individual laboratory. In addition, they have to present their reseach reuslts for evaluation.

Style〉 Experiment

Keyword〉 reseach work, Presentation

Relational Lecture〉 "Practice for undrstanding scientific papers in bioogical technology"(0.5, ⇒141 page), "Internship in Biological science and technology"(0.5, ⇒144 page)

Requirement〉 N/A

Notice〉 N/A

Goal〉 to learn how to perform experiments

Schedule〉

1. Experiments 1
2. Experiments 2
3. Experiments 3
4. Experiments 4
5. Experiments 5
6. Experiments 6
7. Experiments 7
8. Experiments 8
9. Experiments 9
10. Experiments 10
11. Experiments 11
12. Experiments 12
13. Experiments 13
14. Experiments 14
15. Experiments 15
16. Experiments 16

Evaluation Criteria〉 Evaluate rsearch papers for the master degree

Textbook〉 N/A

Reference〉 Research papers

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125210/

Student〉 Able to be taken by only specified class(es)

Contact〉 Administration Office(M703)

Internship in Biological science and technology

Teacher of course (2 units)

Target〉 To obtain knowledges and skills for practicecal works

Outline〉 To work in institutes, inductries, and companies, students can learn practical skills, knowledges, researches, etc., by internship.

Style〉 Internship

Keyword〉 Internship

Relational Lecture〉 "Practice for undrstanding scientific papers in bioogical technology"(0.5, ⇒141 page), "Biological science and technology laboratory"(0.5, ⇒143 page), "生命テクノサイエンス研究論文"(0.5)

Requirement〉 N/A

Notice〉 N/A

Goal〉 To learn what are practical knowledges, skills, and mind.

Schedule〉

1. Choose where to go
2. Schedules depend on where to go.
3. Provide Reports

Evaluation Criteria〉 Evaluate Reports

Textbook〉 N/A

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125211/

Student〉 Able to be taken by only specified class(es)

Earth and Life Environmental Engineering — Biological Science and Technology
Web page and CMS related subject

- *Integrated Subjects*

  Introduction to Intellectual Property ..... WEB page, CMS
  Management Theory of New Business ..... WEB page, CMS
  Management of Technology ..... WEB page, CMS
  Presentation Method (M) ..... WEB page, CMS
  Internship (M) ..... WEB page, CMS
  Venture Business (M) ..... WEB page, CMS

- *Common Subjects*

  Advanced Environmental Technology on Chemistry ..... WEB page, CMS
  Engineering of Biological Environment ..... WEB page, CMS
  Advanced Environmental Systems Engineering ..... WEB page, CMS

- *Basic Departmental Subjects*

  Quantum mechanics and advanced lecture in quantum physics ..... WEB page, CMS
  Superconductivity and superconducting materials ..... WEB page, CMS
  Advanced Computational Science ..... WEB page, CMS
  Methods for analysis of mathematical phenomena ..... WEB page, CMS

- *Applied Departmental Subjects*

  Biochemical Thermodynamics ..... WEB page, CMS
  Advanced Biochemistry ..... WEB page, CMS
  Advanced Molecular Biology ..... WEB page, CMS
  Cell Biotechnology ..... WEB page, CMS
  Advanced Biophysical Chemistry ..... WEB page, CMS
  Advamced Cell Physiology ..... WEB page, CMS
  Advanced Microbiological Engineering ..... WEB page, CMS
  Biomolecular Design ..... WEB page, CMS
  Advanced Biotechnology ..... WEB page, CMS
  Advanced Biomaterials ..... WEB page, CMS
  Advanced enzyme engineering ..... WEB page, CMS
  Technology for Bioreaction ..... WEB page, CMS
  Molecular Biotechnology ..... WEB page, CMS
  Biological macromolecular chemistry ..... WEB page, CMS

- *Specialized Exercise and Experiments*

  Practice for undrstanding scientific papers in bioogical technology ..... WEB page, CMS
  Seminar in Biological Technology ..... WEB page, CMS
  Biological science and technology laboratory ..... WEB page, CMS
  Internship in Biological science and technology ..... WEB page, CMS

Earth and Life Environmental Engineering — Ecosystem Engineering
Syllabus of subjects

List of Subjects

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125105/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125106/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Management of Technology

Associate Professor · Tatsuya Deguchi (2 units)

Target〉 About the production management of the automobile industry, it is understood variously from the point of view such as ”research and development”, ”production management”, ”purchasing” and ”quality control” ”marketing” and ”cross-cultural management”.

Outline〉 It learns about the production management. This time, ”the automobile industry” specially takes up the production management of ”Honda Motor Co.,Ltd. (following Honda)” even of that in the case, and the class to appreciate that importance with ranking of technology in management is taken.

Requirement〉 Finish ” Introduction to new business ” or ” Advanced Lecture in management Theory of new business ” .

Notice〉 Face a class when a taking lecture person surely does enough preparation every time. And moreover, be the worst, but one person one time is to do some remarks every time.

Goal〉

1. The elementary knowledge of management is learned.
2. Ranking of the technology in management and that importance are appreciated.
3. It learns how to solve the various problems which always occur in the spot of the management through the case study and the business game.

Schedule〉

1. Guidance
2. Lecture ”What in Management of Technology?”
3. Case report ”Rsearch and development of Honda”
4. Case study ”Plan an overseas factory.” ”A new car development order”
5. Lecture ” Production management and purchasing”
6. Lecture ”Quality control”
7. Case report ”The production management of Honda”,”The supply chain management of Honda”
8. Case study ”Plan an overseas factory.”
9. Case report ”The quality control of Honda”
10. Case study ”Don't make material defects flare up again.”
11. Lecture ”Marketing strategy”
12. Lecture ”Cross-cultural management”
13. Case report ”Around the products project of Honda - the two-wheeled vehicle ”
14. Case report ”The path of internationalization of Honda”
15. Case report ”The personnel management of Honda”
16. Summary and questions and answers

Evaluation Criteria〉 It is evaluated in the remark (20%) in class and the middle, end of a term report (80% in total).

Textbook〉 It doesn't specially use.The summary and so on is distributed every time.

Reference〉 Several are introduced in class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125107/

Student〉 The person who finished ”Introduction to new business” or ” Advanced Lecture in management Theory of new business “ in all the students enrolled in the doctor former term course. And, the number of taking lecture people is restricted to do intensive learning. (20-25 people will be made an upper limit.) It is selected with some means in case of a taking lecture person many.

Note〉 This class invites seven Honda alumnuni who did work in ”research and development”, ”production management”, ”purchasing”, ”quality control”, ”marketing” , ”cross-culutural management”, and so on as an instructor, and it is the class to do case report. Even if it is seen nationwide, the trial done like this is very rare, and it is a precious class. And, an applicant for taking lecture is to attend it in the guidance to hold it in advance.A schedule is indicated separately.

Presentation Method (M)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125108/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (M)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal.
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125109/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (M)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125110/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Advanced Environmental Technology on Chemistry

Professor · Junko Motonaka, Katsuhiro Tamura, Shigeru Sugiyama, *Associate Professor* · Masahiro Katoh (2 units)

Target〉 The present situation and subjects on chemistry in view of environmental pollution will be introduced. Recent development in chemistry to attempt to solve those subjects will be explained.

Outline〉 Based on the historical background on environmental pollution, the recent progress on analytical chmistry, biochmistry, catalysis and chemical process engineering for environmental protection will be explained. The presentation on environmental subjects by students will be required.

Style〉 Lecture and excercise

Keyword〉 environment, analytical chemistry, biochemistry, catalyst, chemical process

Fundamental Lecture〉 "Advanced Analytical and Environmental Chemistry"(1.0, ⇒103 page), "Advanced Physical Chemistry"(1.0, ⇒101 page), "Advanced Materials Science"(1.0, ⇒106 page)

Relational Lecture〉 "Engineering of Biological Environment"(0.5, ⇒154 page), "Advanced Environmental Systems Engineering"(0.5, ⇒155 page)

Requirement〉 Requires undergraduate level knowlwdge of chemistry and chemical engineering.

Goal〉

1. To understand the present situation for environmental subjects on engineering (lectures from 1st to 5th, 14th and 15th)..
2. To develop ability for solving the environmental subjects (lectures from 6th to 15th).

Schedule〉

1. Histroty on environmental problems (1): Pollution
2. Histroty on environmental problems (2): Approach to solve the problems
3. Histroty on environmental problems (3): Recent technology
4. Recent situation on environmental technology (1): New problems on pollution
5. Recent situation on environmental technology (2): Recent development of technology
6. Approach from analytical chemistry (1)
7. Approach from analytical chemistry (2)
8. Approach from biochemistry (1)
9. Approach from biochemistry (2)
10. Approach from catalysis (1)
11. Approach from catalysis (2)
12. Approach from chemical process engineering (1)
13. Approach from chemical process engineering (2)
14. Presentation (1)
15. Presentation (2). Submission of the report on the present course will be required.

Evaluation Criteria〉 Assignments count 100% mainly based on the presentation and report submitted.

Textbook〉 To be announced in the class.

Reference〉 To be announced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125115/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Motonaka (G611, +81-88-656-7409, motonaka@chem.tokushima-u.ac.jp)
⇒ Tamura (G509, +81-88-656-7416, tamura@chem.tokushima-u.ac.jp)
⇒ Sugiyama (G309, +81-88-656-7432, sugiyama@chem.tokushima-u.ac.jp)
⇒ Katoh (M304, +81-88-656-7429, katoh@chem.tokushima-u.ac.jp)

Engineering of Biological Environment

Professor · Sumihare Noji, Hiroki Kourai, *Associate Professor* · Haruhiko Sakuraba, *Professor* · Akihiko Tsuji, Yoshinori Matsuo (2 units)

Target〉 To understand recent studies on engineering of biological environment

Outline〉 Advanced lectures for recent studies on engineering of biological environment

Style〉 Lecture

Keyword〉 Environment, Biology, Engineering

Requirement〉 N/A

Notice〉 N/A

Goal〉

1. Ecological environment
2. Biological environment
3. Methods for engineering for regulation of biological environment

Schedule〉

1. General concepts of enviromental engineering
2. Environmental ecology
3. Biological roles in environment
4. Roles of the true fungi in environment
5. Roles of the bacteria
6. Roles of the insects in environment
7. Roles of the birds in environment
8. Roles of the mammals in environment
9. Reports
10. Physical controls of biological environment
11. Chemical controls of biological environment
12. Biological controls of environment
13. Molecular designs of reagents for environment
14. Environmental hormones and chiemical pollutions and ethics
15. Recent topics for environmental engineering
16. Final Reports

Evaluation Criteria〉 Evaluation of Reports

Textbook〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125116/

Contact〉 Noji (G803, +81-88-656-7528, noji@bio.tokushima-u.ac.jp)Monday 15:30-17:00

Advanced Environmental Systems Engineering

Professor · Shuichi Hashimoto, *Associate Professor* · Yasunori Kozuki, Shoichiro Fujisawa, *Professor* · Hitoshi Murakami, Osamu Sueda, Akio Kondo, Kei Miwa
Associate Professor · Yoshiyuki Kidoguchi, Shigeki Matsuo, Yoshinobu Hirose (2 units)

Target〉 To understand the present environmental problems and to acquire the advanced of the technique and the approach to solve problems on the point of the ecosystem engineering.

Outline〉 To explain the structure and function of environmental systems, the relationship between civil life and disaster prevention systems, and the changes of social system due to the technological revolution and the policy.

Style〉 Lecture

Keyword〉 environmental policy, natural disaster, energy saving technology, welfare technology, miromechanical engineering

Goal〉

1. To understand the factor of environmental systems
2. To understand the strucure of environmental systems
3. To understand the civil life and natural disaster prevention systems

Schedule〉

1. The policy and natural disaster prevention measures (1)
2. The policy and natural disaster prevention measures (2)
3. The factor of environmental systems
4. Example of environmental systems
5. The structure of environmental systems
6. Example of structure of environmental systems
7. Civil life and nano-technology 1
8. Civil life and nano-technology 2
9. Midterm presentation
10. Well being technology 1
11. Well being technology 2
12. Ecosystem engineering 1
13. Ecosystem engineering 2
14. Hydrogen engine technology
15. Diesel engine engineering

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in th class

Reference〉 To be introduced in th class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125117/

Contact〉 Kozuki (Eco505, +81-88-656-7335, kozuki@eco.tokushima-u.ac.jp)

Advanced Computational Science

Professor · Toshiki Takeuchi (2 units)

Target〉 This class provides the basic technology for numerical calculation for the differential equation.

Outline〉 The numerical calculation methods for the differential equation are introduced.

Style〉 Lecture

Keyword〉 Numerical analysis, Numerical computation, Differential equation

Fundamental Lecture〉 "Numerical Analysis"(1.0), "Basic Mathematics"(1.0), "Basic Mathematics"(1.0)

Relational Lecture〉 "Methods for analysis of mathematical phenomena"(1.0, ⇒18 page), "Numerical Analysis"(1.0)

Requirement〉 Students have to understand basic mathematics of undergraduate-level.

Goal〉 To understand principle of numerical calculation methods.

Schedule〉

1. Introduction of numerical simulation
2. Mathematical model
3. Least squares method
4. Lagrange interpolation
5. Spline interpolation
6. Finite difference method
7. Arbitrary precision formula
8. Application to the 1-dimension differential equation
9. Application to the 2-dimension differential equation
10. Gauss-Seidel method
11. Successive Over-Relaxation method
12. Explicit method
13. Implicit method
14. Crank-Nicolson method
15. Numerical instabilities

Evaluation Criteria〉 Assignments count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125213/

Student〉 Able to be taken by only specified class(es)

Contact〉 Takeuchi (A206, +81-88-656-7544, takeuchi@pm.tokushima-u.ac.jp)

Topics of Analysis for Mathematical Science

Associate Professor · Atsuhito Kohda (2 units)

Target〉 Mathematical theory and technique for analysis of engineering phenomena

Outline〉 Mathematical theory to analyze problems in engineering and its application, mainly theory and technique of differential equations

Style〉 Lecture

Relational Lecture〉 "Advanced applied analysis"(0.2, ⇒22 page), "Differential Equations"(0.2, ⇒19 page)

Requirement〉 If you like undergraduate-level mathematics, it will be sufficient.

Goal〉 To be familiar with mathematical theory, that helps engineering study.

Schedule〉

1. Introduction to basic modern mathematics 1
2. Introduction to basic modern mathematics 2
3. Linearity and nonlinearity
4. Representation formula and existence of solutions 1
5. Representation formula and existence of solutions 2
6. Representation formula and existence of solutions 3
7. Behavior of solutions and problems of engineering 1
8. Behavior of solutions and problems of engineering 2
9. Solutions and spaces of functions 1
10. Solutions and spaces of functions 2
11. Solutions and spaces of functions 3
12. Topics of modern analysis 1
13. Topics of modern analysis 2
14. Mathematics and computer
15. Summary

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125214/

Contact〉 Kohda (A211, +81-88-656-7546, kohda@pm.tokushima-u.ac.jp)

Advanced applied analysis

Assistant Professor · Kuniya Okamoto (2 units)

Target〉 To learn the functional analytic methods which are basic tools for mathematical sciences.

Outline〉 This subject provides basic theory of functional analysis which is considered as linear algebra in infinite-dimensional spaces. Functional analytic approaches to phenomena described by differential equations are introduced.

Goal〉 To apply the theory of modern analysis and recognize its significant role.

Schedule〉

1. Introduction (What is functional analysis?)
2. Linear operators on finite-dimensional linear spaces
3. Eigenvalue problems
4. Matrix exponentials
5. Hilbert spaces, Banach spaces
6. Function spaces
7. Linear operators in infinite-dimensional linear spaces
8. Spectral resolutions
9. Fourier transforms
10. Operational calculus
11. Integral transforms, Resolvent operators
12. Strongly continuous semigroups
13. Abstract Cauchy problems
14. Applications to partial differential equations
15. Summary

Webpage〉 http://math9.pm.tokushima-u.ac.jp/lecture/

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125215/

Contact〉 岡本 (A212 室, TEL/FAX: 656-9441, E-mail: okamoto@pm.tokushima-u.ac.jp)

Quantum mechanics and advanced lecture in quantum physics

Associate Professor · Yoshitaka Michihiro (2 units)

Target〉 This class introduces the quantum mechanics.

Outline〉 Basics of quantum mechanics are introduced.

Style〉 Lecture

Goal〉 To understand the outline of quantum mechanics.

Schedule〉

1. Introduction
2. Variation
3. Lagrangian
4. Hamiltonian
5. The principles of quantum mechanics (1) Operator
6. The principles of quantum mechanics (2) Wavefunction
7. The principles of quantum mechanics (3) Expectation value
8. The principles of quantum mechanics (4) Schrödinger equation
9. Example (1) the square well potential
10. Example (2) the linear harmonic oscillator
11. Example (3) hydrogen atom
12. The principles of quantum mechanics (5) Heisenberg equation
13. Many-body problem
14. Field quantization
15. Phonon

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125216/

Contact〉 Yoshitaka Michihiro (A203)

Nano-material Engineering

Professor · Shuichi Hashimoto (2 units)

Target〉 To understand the physical and chemical properties of materials for the desing anf assemlbly of nano-structured materials with special consideration to environmental issues

Outline〉 Physical and chemical properties as well as evaluation techniques of various materials will be discussed on the basis of micro- and nanostructure.

Style〉 Lecture

Goal〉 環境との相互作用を考慮しつつさまざまな材料の性質をミクロな視点から理解すること.

Schedule〉

1. Introduction
2. Structure of solids
3. Structure of sodids
4. Optical properties of solids
5. Optical properties of solids
6. Optical properties of solids
7. Optical properties of solids, assignment1
8. Evaluation technique of nano-materials
9. Evaluation technique of nano-materials
10. Evaluation technique of nano-materials
11. Evaluation technique of nano-materials,aasignment2
12. Application of nano-materials
13. Application of nano-materials
14. Current topics in nano-materilals and nanotechnology
15. Current topics in nano-materilals and nanotechnology
16. exam

Evaluation Criteria〉 assignment1 25% assgnment2 25% exam 50%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125217/

Micromechanics

Associate Professor · Shigeki Matsuo (2 units)

Target〉 To understand the science of micro-to-nanometer domain, and learn the techniques to investigate such a domain.

Outline〉 To study the methods for precise measurement and manufacturing, in addition, microsensors, micromachining, and microactuators. In addition, hot topics concerning science and technology will be referred and discussed at any time.

Style〉 Lecture

Keyword〉 micro, nano

Goal〉 To obtain basic knowledges on the micro-to-nanometer domain

Schedule〉

1. Physics and chemistry in microdomain
2. Physics and chemistry in microdomain
3. Physics and chemistry in microdomain
4. Physics and chemistry in microdomain
5. Measurements in microdomain
6. Measurements in microdomain
7. Measurements in microdomain
8. Micromachining
9. Micromachining
10. Micromachining
11. Microsensors
12. Microsensors
13. Microsensors
14. Microactuators
15. Microactuators

Evaluation Criteria〉 Assignments count 100%.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125218/

Energy and Environmental Engineering

Professor · Kei Miwa (2 units)

Target〉 This class addresses to understand characteristics and background of the global warming problem and the depletion of energy resources for effective utilization system of energy resources.

Outline〉 Lecture on fossil fuels resources, environmental pollutant and environmental loading, principal of thermal energy conversion and conversion technology, nuclear energy and thermal reactor, the renewable energy and waste energy systems.

Keyword〉 Environmental problem, Energy security, Global warming, Energy conversion

Requirement〉 None

Notice〉 Basic subjects concerning the engineering

Goal〉 To understand characteristics and background of the global warming problem and the depletion of energy resources, and to master the ability solving the energy security on the point of engineering field.

Schedule〉

1. Energy Fundamentals
2. Pollution of the Atmosphere
3. Principal of Thermal Energy Conversion
4. Thermal Energy Conversion System
5. Fossil Fuels Coal, Petroleum and Natural Gas-
6. Combustion Method and System of Fossil Fuels
7. Nuclear Energy (1) Nuclear Fission
8. Nuclear Energy (2) Nuclear Fusion
9. Geothermal Energy System
10. Water and Wind Energy System
11. Solar Energy System
12. Biomass Energy System
13. Wastes Energy System
14. Hydrogen Energy System
15. Energy and Environment in Future
16. Summary and Final Report for Evaluation

Evaluation Criteria〉 Grading with final report

Textbook〉 To be introduced before the first lecture

Reference〉 To be intriduced in the class

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/miwa/index.html

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125219/

Student〉 Able to be taken by student of other department

Contact〉 Miwa (Eco503, +81-88-656-7370, miwa@eco.tokushima-u.ac.jp)Please knock always.

Energy conversion systems

Associate Professor · Yoshiyuki Kidoguchi (2 units)

Target〉 To understand principle of energy conversion and to consider improvement of energy conversion technologies on the point of saving energy consumption and decreasing environmental damages

Outline〉 Lecture on principle of energy conversion and its application, and on combustion mechanism and technologies of reducing toxic emissions of combustion engines as examples of energy conversion systems. This subject is concerned with industry.

Style〉 Lecture

Keyword〉 Energy conversion, Energy resources, Combustion, Toxic emissions, Environmental protection

Requirement〉 None

Notice〉 None

Goal〉 To understand principle of energy conversion, environmental effect of energy conversion and present technologies of energy conversion, and to recognize the importance of improvement of energy conversion technologies against environmental protection

Schedule〉

1. Present energy problem
2. Energy resources
3. Fundamental of energy conversion
4. Energy conversion by combustion
5. Combustion chemistry
6. Combustion of gaseous fuels (1)
7. Combustion of gaseous fuels (2)
8. Combustion of liquid fuels (1)
9. Combustion of liquid fuels (2)
10. Formation of emissions caused by combustion
11. Present energy conversion technologies
12. Energy conversion and energy recirculation
13. Energy conversion and environmental problems (1)
14. Energy conversion and environmental problems (2)
15. Energy saving in energy conversion

Evaluation Criteria〉 Appraise the understanding of the content of the lecture by setting some reports

Textbook〉 Yokio Mizutani, "Combustion Engineering"

Reference〉 None

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/miwa/index.html

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125220/

Student〉 Any students other than this course can take this subject

Contact〉 Kidoguchi (Eco502, +81-88-656-9633, kidog@eco.tokushima-u.ac.jp)

Note〉 Need to submit some reports

Urban and Regional Planning

Professor · Akio Kondo (2 units)

Target〉 The concept and technique to describe not only the vision but also design in the future urban and regional plan are lectured.

Outline〉 The technique of urban and regional planning is explained using various materials in practical planning. The debate is introduced to develop the ability in design of planning for students.

Style〉 Lecture and excercise

Keyword〉 Urban and Regional Planning, Proposition of Vision, Planning Design

Fundamental Lecture〉 "Advanced Environmental Systems Engineering"(0.2, ⇒155 page)

Relational Lecture〉 "Information Engineering of Regional Environment"(0.8, ⇒165 page)

Requirement〉 特になし

Notice〉 特になし

Goal〉 To understand the concept and technique to describe the future urban and regional plan.

Schedule〉

1. Guidance and purpose of this subjec
2. Examples of urban planning
3. Examples of regional planning
4. Planning and law 1
5. Planning and law 2
6. Economic analysis in planning 1
7. Economic analysis in planning 2
8. Systems analysis in planning 1
9. Systems analysis in planning 2
10. Explanation of Exercise
11. Exercise of planning 1
12. Exercise of planning 2
13. Presentation of planning
14. Discussion about the future of region
15. Discussion about the vision of region

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/kondo/top/index.htm

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125221/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Note〉 特になし

Information Engineering of Regional Environment

Associate Professor · Yoshinobu Hirose (2 units)

Target〉 The information of regional environment, technique in survey, information management and computer aid systems are explained. The method and technique using for application of environmental information to development of regional policies are lectured.

Outline〉 The information of regional environment, technique in survey, information management and computer aid systems are explained using the various kinds of materials and examples in practical planning.

Style〉 Lecture and excercise

Keyword〉 Information of Regional Environment, Technique in Survey, Computer Aid Systems

Relational Lecture〉 "Urban and Regional Planning"(0.8, ⇒164 page), "Advanced Environmental Systems Engineering"(0.2, ⇒155 page)

Requirement〉 特になし

Notice〉 特になし

Goal〉 To obtain the knowledge of the information of regional environment, technique in survey, information management and computer aid systems, and apply them to design of regional plan and political simulation.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of information of regional environment
3. Variety of information of regional environment
4. Technique in survey of information
5. Technique in production of information
6. Technique in management of information
7. Computer aid systems 1
8. Computer aid systems 2
9. Application of information to regional planning
10. Exercise of application of information 1
11. Exercise of application of information 2
12. Exercise of application of information 3
13. Presentation of results of exercise
14. Discussion about the information in the future
15. Discussion about the technique in the future

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/kondo/top/index.htm

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125222/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Note〉 特になし.

Principles of Disaster Risk

Professor · Hitoshi Murakami (2 units)

Target〉 To understand concept of risk, risk management, damage reducing measure ability to natural disaster

Outline〉 To understand histrical earthquakes and tsunamis , characteristics of earthquake and tsunami, prediction of damage , to cultivate presentation skill and debate ability.

Keyword〉 Earthquakes and Tsunamis, Disaster Prevention Assessment, Risk Manegement

Relational Lecture〉 "Principle of Environmental Risk"(0.5, ⇒167 page)

Goal〉 Training-up of technical knowledge to the natural disaster, the basic knowledge which can correspond to the risk management and the crisis management

Schedule〉

1. Guidance, Outline of Disaster Risk
2. Natural Disasters and Their Regulations
3. Histrical Earthquakes and Tsunamis in Japan(No.1)
4. Histrical Earthquakes and Tsunamis in Japan(No.2)
5. Characteristics of Earthquake and Tsunami(No.1)
6. Characteristics of Earthquake and Tsunami(No.2)
7. Generation Characteristics of Nankai Earthquake and Tsunami(Focal Region and Wave Source Region)(No.1)
8. Generation Characteristics of Nankai Earthquake and Tsunami(Focal Region and Wave Source Region)(No.2)
9. Disaster Prevention Assessment for Earthquakes and Tsunamis(No.1)
10. Disaster Prevention Assessment for Earthquakes and Tsunamis(No.2)
11. Risk Management for Earthquakes and Tsunamis(No.1)
12. Risk Management for Earthquakes and Tsunamis(No.2)
13. Risk Management for Earthquakes and Tsunamis(No.3)
14. Risk Management for Earthquakes and Tsunamis(No.4)
15. Summary

Evaluation Criteria〉 Assignments Count 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125223/

Student〉 To be limited to students of course

Contact〉 Murakami (Eco504, +81-88-656-7334, murakami@eco.tokushima-u.ac.jp)Monday 16:20-17:50

Principle of Environmental Risk

Associate Professor · Yasunori Kozuki (2 units)

Target〉 To understand knowledge concerning the Environmental Risk and to develop effective program for risk communication.

Outline〉 To explain the definition and kinds of environment risk, risk evaluation and risk management. To develop a program for risk communication on the point of the environmental education.

Style〉 Lecture and excercise

Keyword〉 environmental risk, environmental education

Fundamental Lecture〉 "Advanced Environmental Systems Engineering"(1.0, ⇒155 page)

Relational Lecture〉 "mitigation engineering"(0.5, ⇒171 page), "Advanced Environmental Ecology"(0.5, ⇒172 page)

Goal〉 To be able to examine technique to mitigate and prevent the environmental risk

Schedule〉

1. Guidance and purpose of this subject
2. Example of the environmental risk
3. Surveying a subject about the environmental risk (1)
4. Surveying a subject about the environmental risk (2)
5. Surveying a subject about the environmental risk (3)
6. Surveying a subject about the environmental risk (4)
7. Midterm presentation
8. Surveying a subject about the environmental risk (5)
9. Surveying a subject about the environmental risk (6)
10. Surveying a subject about the environmental risk (7)
11. Surveying a subject about the environmental risk (8)
12. Surveying a subject about the environmental risk (9)
13. Presentation of results of surveying (1)
14. Presentation of results of surveying (2)
15. Discussion about the environmental risk in the future

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125224/

Contact〉 Kozuki (Eco505, +81-88-656-7335, kozuki@eco.tokushima-u.ac.jp)

Note〉 特になし

Well-being Technology for All

Professor · Osamu Sueda, *Associate Professor* · Shoichiro Fujisawa (2 units)

Target〉 To understand the philosophy of welfare and the classification of disability, and to learn the importance of assistive technology.

Outline〉 The role and the neccessity of assistive technology will be explained, and provisions and means to assiste a person with disabilities in daily living will be lectured.

Keyword〉 assistive technology, a person with disability, aged paople, assistive products, assist of daily living

Goal〉 To understand the role and the necessity of the well-being technology, and to understand technical provisions and means to assist a person with disability in daily living.

Schedule〉

1. History of rehabilitation engineering
2. Statistics of persons with disabilities
3. Classification of disabilities (1)
4. Classification of disabilities (2)
5. Infrastructure for persons with sensory impairments
6. Infrastructure for persons with physical impairments
7. Infrastructure for persons with intelectual impairments
8. Objective of a white cane and how to use it
9. experience of disability (1) : visual impairment
10. experience of disability (2) : visual impairment
11. Assistive products for transfer and mobility
12. Dynamics of wheelchair
13. experience of disability (3) : physical impairment
14. experience of disability (4) : physical impairment
15. Conclusion

Evaluation Criteria〉 Understanding of lecture will be evaluated through reports submitted after each lesson.

Textbook〉 To be introduced in th class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125225/

Contact〉 Sueda (Eco705, +81-88-656-2167, osamu-sueda@eco.tokushima-u.ac.jp)

Design of Assistive Products

Professor · Osamu Sueda, *Associate Professor* · Shoichiro Fujisawa (2 units)

Target〉 It aims to learn how to realize and how to keep the quality of assistive products in the view point of international marketing and to acquire the ability of designing of products used at office, working place and home in which the concept of adapting the device to the human being is installed.

Outline〉 Assistive technology for daily living of persons with disabilities in the society. Human factors and R & D of assistive products and services. Adapting the environment to the people instead of the people adapting to the environment. Evaluation of appropriateness of assistive technology system for a person.

Style〉 Lecture

Keyword〉 Assistive product, Japanese Industrial Standard, International Standard, ISO, Outcome measure

Goal〉 Objective of this lecture is to understand the current state of assistive products in the world and international standard of them, and to learn designing of them. Moreover, it aimed to learn the method of outcome measure of assistive products and to be able to consider the total arrangement of products at working place and at home.

Schedule〉

1. Introduction : assitive products as industrial products, ergonomic approach
2. Situation of assistive technology in the world : North America, Europe and Japan
3. Assitive products as industrial products : Japanese Standard, International Standard an Guidelines for all people including elderly and people with disabilities
4. Human factors (1) : Decrease of physical function according to aging
5. Human factors (2) : Decrease of sensory function according to aging
6. Japan Industrial Standards of Assistive Products : Wheelchair (1)
7. Japan Industrial Standards of Assistive Products : Wheelchair (1)
8. Japan Industrial Standards of Assistive Products : Artificial Legs
9. Japan Industrial Standards of Assistive Products : Artificial Arms
10. Japan Industrial Standards of Assistive Products : Beds
11. Japan Industrial Standards of Assistive Products : Hoists
12. Personal environment control system : Smart House, ECS and Home bus system
13. Fitting of assistive products in daily living (1) : Methods of outcome measure
14. Fitting of assistive products in daily living (2) : Methods of outcome measure
15. Guideline for work place : Legislation and remodeling of work place

Evaluation Criteria〉 Results will be evaluated through the lecture and reports submitted after each lesson.

Reference〉 To be introduced in th class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125226/

Contact〉 Sueda (Eco705, +81-88-656-2167, osamu-sueda@eco.tokushima-u.ac.jp)

Chemistry and Technology for Recovery of Marine Resources

Professor · Takahiro Hirotsu (2 units)

Target〉 This class describe the recovery of valuable elements in seawater that have not been utilized.

Outline〉 This class describe the advanced technology of recovery of valuable elements such as uranium and lithium in sewater and the remained subjects for practical use.

Style〉 Lecture

Keyword〉 seawater, rare resouces, recovery, uranium, lithium, adsorption, ion exchange, chelation

Goal〉 understanding of the technology of recovery of valuable resources from seawater

Schedule〉

1. Importance of recovery of valuable resources from seawater
2. Inorganic resources in seawater
3. Recovery methods of valuable resources in seawater 1
4. Recovery methods of valuable resources in seawater 2
5. Adsorption method 1
6. Adsorption method 2
7. Development of adsorbents 1: ion-exchangers
8. Development of adsorbents 2: ion-exchangers
9. Development of adsorbents 3: chelating resins
10. Development of adsorbents 4: chelating resins
11. Mechanism of ion-exchange of lithium ions
12. Recovery process of lithium from seawater
13. Mechanism of uptake of uranium
14. Recovery process of uranium
15. Recovery costs of uranium and lithium
16. Perspective of recovery of uranium and lithium from seater

Evaluation Criteria〉 Evaluation of degree of understanding by report of some essential subjects

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125227/

Student〉 Able to be taken by student of other department and faculty

Contact〉 Hirotsu (National Institute of Advanced Industrial Science and Technology, +81-87-869-3562, takahiro-hirotsu@aist.go.jp)

mitigation engineering

Professor · Hideki Ueshima (2 units)

Target〉 To understand the background and the significance of mitigation and to acquire fundamental principles of mitigation technique.

Outline〉 To explain western environmental ideas, progress of coastal development and concept, history, technology and examples of mitigation

Style〉 Lecture

Keyword〉 District Improvement Plan for Disaster Mitigation, coastal environment, ecosystem, environmental restoration

Fundamental Lecture〉 "Principle of Environmental Risk"(1.0, ⇒167 page), "Principles of Disaster Risk"(1.0, ⇒166 page), "Urban and Regional Planning"(1.0, ⇒164 page)

Relational Lecture〉 "Advanced Environmental Ecology"(0.5, ⇒172 page), "Advanced Environmental Systems Engineering"(0.5, ⇒155 page)

Goal〉 To acquire ideas and fundamental of mitigation

Schedule〉

1. Guidance of this subject
2. Background and history of the mitigation
3. Coastal development(1)
4. Coastal development(2)
5. Deterioration of costal environment
6. Restoration for coastal environment
7. Mitigation for coastal environment(1)
8. Mitigation for coastal environment(2)
9. Mitigation technology(1)
10. Mitigation technology(2)
11. Mitigation technology(3)
12. Example of mitigation in Western Europe
13. Example of mitigation in Japan(1)
14. Example of mitigation in Japan(2)
15. Discussion

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125228/

Contact〉 Ueshima (National Institute of Advanced Industrial Science and Technology, +81-823-72-1901, h-ueshima@aist.go.jp)

Advanced Environmental Ecology

Associate Professor · Mahito Kamada (4 units)

Target〉 The purpose is to develop the knowledge and skill for conservation and restoration of ecosystems.

Outline〉 Current situation of ecosystems and technical problems for conservation and restoration are explained. The way of ecosystem management is emphasized to improve ecosystem. All students must give a presentation to introduce their own activities.

Style〉 Lecture

Keyword〉 Ecosystem management, Environmental conservation, Nature restoration

Goal〉 Every student has basic knowledge and skill to improve ecosystem function in the actual society.

Schedule〉

1. Guidance
2. Interdisciplinary aspects for ecosystem management 1
3. Interdisciplinary aspects for ecosystem management 2
4. Current situation and problems in ecosystem management 1
5. Current situation and problems in ecosystem management 2
6. Current situation and problems in ecosystem management 3
7. Current situation and problems in ecosystem management 4
8. View points to know the structure and function of ecosystems 1
9. View points to know the structure and function of ecosystems 2
10. View points to know the structure and function of ecosystems 3
11. View points to know the structure and function of ecosystems 4
12. Toward an adequate management of ecosystems 1
13. Toward an adequate management of ecosystems 2
14. Toward an adequate management of ecosystems 3
15. General discussion / Report

Evaluation Criteria〉 Result is evaluated by contents of the reports, which are set after every related lectures. Over 60% marks is necessary to pass.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125229/

Student〉 Able to be taken by student of other department and faculty

Contact〉 Kamada (A306, +81-88-656-9134, kamada@ce.tokushima-u.ac.jp)

City and Transport System Planning

Professor · Hideo Yamanaka, *Part-time Lecturer* · Masahiro Miyake (4 units)

Target〉 Advanced course on concept and case study of social and public policies on urban, regional and transport planning. Study on contents and usage of measures on such planing fields.

Outline〉 Lectures on Systems approaches on city planning and transport planning, theories and usage of planning models and planning methods. A unit is consisted of three hours llecture and an hour training.

Style〉 Lecture and excercise

Keyword〉 City Plannig, Transport Planning, Concensus Building

Fundamental Lecture〉 "Urban & Transport Planning"(1.0), "Project Evaluation Methods for Infrastructure Planning"(1.0)

Relational Lecture〉 "都市 · 地域計画論"(0.5), "Infrastructure Planning"(0.5)

Goal〉

1. Understanding of problems and recent strategies on city and transport planning
2. Understanding of concensus buidling method for developing city and transport strategies

Schedule〉

1. Problems of City and Transport Systems 1
2. Problems of City and Transport Systems 2
3. Recent Planning Strategies of City and Transport System 1
4. Recent Planning Strategies of City and Transport System 2
5. Recent Planning Strategies of City and Transport System 3
6. Recent Planning Strategies of City and Transport System 4
7. Debate by gropus on transport strategies
8. Method of Dicision Making and Social Concensus Building
9. Negociation theory and Concemnsus Building
10. Negociation Simulation 1
11. Negociation Simulation 2
12. Project Cycle Management Participatory Planning Method 1
13. Project Cycle Management Participatory Planning Method 2
14. Project Cycle Management Participatory Planning Method 3
15. Debate by groups on Concensus Building

Evaluation Criteria〉 Achievement level of the each target is evaluated by the submitted essays and reports. Score of 60points or over is required to clear the target. Students are required to clearr the both of targets. Total score is average of the scores of two targets.

Textbook〉 Textbook is ibtroduced in the class. Realted documents is distributed to students.

Reference〉 Rojer Fisher and Williamn Uly: Getting to yes, Houghton Miffin,1981

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125230/

Student〉 Able to be taken by student of other department

Contact〉 Yamanaka (A410, +81-88-656-7350, yamanaka@ce.tokushima-u.ac.jp)

Actuator Control Theory

Associate Professor · Kyoji Hashimoto (2 units)

Target〉 This class introduces the characteristics of actuators, the design methods of servo system.

Outline〉 The structure and function of actuators or control valves, the design of servo system, PWM control method, the practical and intelligent control algorithm are explained.

Style〉 Lecture

Keyword〉 actuator, servo system, control algorithm

Relational Lecture〉 "Measurement Science and Technology"(0.5, ⇒175 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level control engineering and related subjects.

Goal〉 To understand the design methods of servo system using actuators.

Schedule〉

1. Outline of actuators
2. Micro-drive electromotive actuators
3. Electromotive actuators
4. Novel actuators
5. Hydraulic actuators
6. Hydraulic control valves
7. Hydraulic servo system
8. Pneumatic actuators
9. Pneumatic control valves
10. Pneumatic servo system
11. PWM control method
12. Model matching methods
13. Neural controller
14. Two-degree-of-freedom control method
15. Model driven control method
16. Examination

Evaluation Criteria〉 Assignments count 30 % and examination count 70 %.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125231/

Student〉 Able to be taken by only specified class(es)

Contact〉 Hashimoto (M420, +81-88-656-7387, hasimoto@me.tokushima-u.ac.jp)

Measurement Science and Technology

Professor · Tetsuo Iwata, *Assistant Professor* · Hiroyuki Ukida (2 units)

Target〉 To understand importance of the Fourier transformation for developing various kinds of measurement techniues, measurement equipments, measurement systems.

Outline〉 Among the various measurement techniques used in the fundamental and applied research, optical measuremnt methods including their principles, methodologies, instrumentations, and evaluation methods are reviewed. In the lecture, emphasized is the importance of the concept of the Fourier transformation to understand and to deal with linear systems in the modern scientific measurement system. Practical methods of object inspections, distance measurements, and shape reconstructions using images are also lectured.

Style〉 Lecture

Keyword〉 measurement techniques, measurement devices, Fourier transform

Relational Lecture〉 "Micro-Nano Engineering"(0.5, ⇒76 page), "Digital Control Theory"(0.5, ⇒70 page), "Actuator Control Theory"(0.5, ⇒71 page)

Goal〉

1. 1. To understand Fourier series and Fourier transform.
2. 2. To understand relarions among Fourier transform and measurement principles of scientific instruments.
3. 3. To understand techniques used with practicable various mearurement devices.

Schedule〉

1. Frequency response of the amplifier
2. Optical information processing
3. Fourier-transform infrared spectoroscopy
4. Subfringe interferometry
5. Computed tomography
6. Sampling theorem and quantization theorem
7. Wavelet transformation
8. Lock-in amplifier and boxcar integrator
9. Optics for microscope
10. X-ray diffration
11. Image measurement systems
12. Feature extraction from images
13. Binocular stereo method
14. Pattern projection
15. Shape from shading and texture
16. Examination

Evaluation Criteria〉 Assignments count 50% and examinations count 50%.

Textbook〉 Printed synopses are used.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125232/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Iwata (M427, +81-88-656-9743, iwata@me.tokushima-u.ac.jp)
⇒ Ukida (M424, +81-88-656-9448, ukida@me.tokushima-u.ac.jp)

Advanced Theory of Electronic Circuits

Professor · Masaki Hashizume, *Associate Professor* · Hiroyuki Yotsuyanagi (2 units)

Target〉 The purpose of this lecture is to understand advanced theory and the state-of-the-art technology for the IC implementation.

Outline〉 Electronic circuits have been implemented as ICs. This lecture introduces advanced theories and the state-of-the-art technologies for the IC implementation. The following are the topics: 1. Analysis and synthesis of logic circuits, 2. Integrated digitail circuits, 3. Analysis and synthesis of analog circuits, 4. Integrated analog circuits, 5. Low power digital circuits

Style〉 Lecture in combination with Portfolio

Keyword〉 electronic circuits, IC implementation, integrated circuits, circuit design

Fundamental Lecture〉 "Electronic Circuits"(1.0), "Computer Circuits"(1.0)

Relational Lecture〉 "Advanced Theory of Integrated Circuits"(0.3, ⇒216 page)

Requirement〉 Familiarity with electric circuit and IC technology

Goal〉 To understand advanced theories and the state-of-the-art technologies for IC implementation of electronic circuits.

Schedule〉

1. Introduction of related topics
2. The state-of-the-art technologies for IC implementation (13wks)
3. Examination
4. The exposition about the examination

Evaluation Criteria〉 Attendance and presentation:30%; Final examination:70%

Textbook〉 specified in the first class

Reference〉 introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125233/

Student〉 Able to be taken by student of other department

Contact〉

⇒ Hashizume (, +81-88-656-7473, tume@ee.tokushima-u.ac.jp)
⇒ Yotsuyanagi (, +81-88-656-9183, yanagi4@ee.tokushima-u.ac.jp)

Note〉 This lecture will be given in English.

Optical propertics of materials

Professor · Masuo Fukui, *Associate Professor* · Masanobu Haraguchi (2 units)

Target〉 To understand the princeple of optical response of atoms, melecules and crystals. To develop ability to apply such optical phenomena to applications.

Outline〉 With quantum mechanics, we lecture optical process of materials. This course will cover the following topics: optical propaties of materials for enegineering, classical electromagnetic theory and optical property, optical transitions and optical process of atoms, molecules and semiconductors.

Style〉 Lecture

Keyword〉 Quantum mechanics, condensed matter, optical process, semiconductor

Relational Lecture〉 "Advanced Optical and Optoelectronic Devices"(0.5, ⇒263 page), "Lecture in Optical Materials and Devices, Part 1"(0.5, ⇒272 page)

Requirement〉 Students should have fundamental knowledges of quamtum mechanics.

Goal〉

1. Students can explain the optical processes of atoms and molecules.
2. Students can explain the optical processes in semiconductors.

Schedule〉

1. Introduction
2. Optical response described by classical electro-magnetic theory
3. Schroedinger equation and wave fuction
4. Hydrogen atom model
5. spin angular momentum
6. Quantum mechanics of light
7. Transition induced by interaction between electron state and light
8. Light absorption and emittion
9. Electron transition in atoms and molecules
10. Optical spectra of atoms and molecules
11. Optical spectra of organic molecules
12. Energy bands in condensed matters
13. Optical processes in semiconductors
14. Optical spectra of impurity atoms in a crystall
15. Optical process of P-N junction
16. Final Examination

Evaluation Criteria〉 Activity: 20%, Reports: 40% and Final Exam.:40%

Textbook〉 中澤，鎌田著，光物性 · デバイス工学の基礎，培風館 1999

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125234/

Contact〉

⇒ Haraguchi (Opt.209, +81-88-656-9411, haraguti@opt.tokushima-u.ac.jp)16:05-18:00

⇒ Fukui (Opt.208, +81-88-656-9410, fukui@opt.tokushima-u.ac.jp)

Advanced Ecosystem Engineering Seminar

Teacher of course (4 units)

Target〉 To improve the skill of presentation, writing, reading and discussion regarding the ecosystem engineering by reading the current paper written in English

Outline〉 Students read the current paper written in English under the supervision of faculties and present orally their contents

Style〉 Portfolio

Keyword〉 ecosystem engineering, peruse paper in English

Goal〉 To obtain the fundamental knowledge regarding research theme and the presentation skill

Schedule〉

1. Seminar on research theme

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125238/

Student〉 Able to be taken by only specified class(es)

Advanced Ecosystem Engineering Exercise

Teacher of course, *Professor* · Yoshihiko Hosoi, , Hiroaki Misawa (6 units)

Target〉 To learn the current issue about the ecosystem engineering in the various kinds of fields and to improve the abilities to find and solve problems related to the research theme.

Outline〉 External experts lecture on the current issue about the ecosystem engineering.

Style〉 Lecture in combination with Portfolio

Keyword〉 ecosystem engineering

Notice〉 Students have to take every lecture to acquire the credit of this subject.

Goal〉 To understand how to find and solve problems related to the research theme

Schedule〉

1. Guidance
2. The current issue in the ecosystem engineering(1)
3. The current issue in the ecosystem engineering(2)
4. The current issue in the ecosystem engineering(3)
5. The current issue in the ecosystem engineering(4)
6. The current issue in the ecosystem engineering(5)

Evaluation Criteria〉 Assignment count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125239/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kozuki (Eco505, +81-88-656-7335, kozuki@eco.tokushima-u.ac.jp)

Ecosystem Engineering Laboratory

Teacher of course (4 units)

Target〉 To perform experiments toward Master's thesis

Outline〉 Students perform experiments towards their Master's thesis under the supervision of faculties.

Style〉 Lecture and excercise

Keyword〉 ecosystem engineering, Master's thesis

Goal〉 To summarize the results of experiments and to present the contents

Schedule〉

1. Experiments and research

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125240/

Student〉 Able to be taken by only specified class(es)

Earth and Life Environmental Engineering — Ecosystem Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Management of Technology ..... WEB page, CMS
  - Presentation Method (M) ..... WEB page, CMS
  - Internship (M) ..... WEB page, CMS
  - Venture Business (M) ..... WEB page, CMS
- *Common Subjects*
  - Advanced Environmental Technology on Chemistry ..... WEB page, CMS
  - Engineering of Biological Environment ..... WEB page, CMS
  - Advanced Environmental Systems Engineering ..... WEB page, CMS
- *Basic Departmental Subjects*
  - Advanced Computational Science ..... WEB page, CMS
  - Topics of Analysis for Mathematical Science ..... WEB page, CMS
  - Advanced applied analysis ..... WEB page, CMS
  - Quantum mechanics and advanced lecture in quantum physics ..... WEB page, CMS
- *Applied Departmental Subjects*
  - Nano-material Engineering ..... WEB page, CMS
  - Micromechanics ..... WEB page, CMS
  - Energy and Environmental Engineering ..... WEB page, CMS
  - Energy conversion systems ..... WEB page, CMS
  - Urban and Regional Planning ..... WEB page, CMS
  - Information Engineering of Regional Environment ..... WEB page, CMS
  - Principles of Disaster Risk ..... WEB page, CMS
  - Principle of Environmental Risk ..... WEB page, CMS
  - Well-being Technology for All ..... WEB page, CMS
  - Design of Assistive Products ..... WEB page, CMS
  - Chemistry and Technology for Recovery of Marine Resources ..... WEB page, CMS
  - mitigation engineering ..... WEB page, CMS
  - Advanced Environmental Ecology ..... WEB page, CMS
  - City and Transport System Planning ..... WEB page, CMS
  - Actuator Control Theory ..... WEB page, CMS
  - Measurement Science and Technology ..... WEB page, CMS
  - Advanced Theory of Electronic Circuits ..... WEB page, CMS
  - Optical propertics of materials ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Ecosystem Engineering Seminar ..... WEB page, CMS
  - Advanced Ecosystem Engineering Exercise ..... WEB page, CMS
  - Ecosystem Engineering Laboratory ..... WEB page, CMS

Systems Innovation Engineering

Systems Innovation Engineering — Electrical and Electronic Engineering
Syllabus of subjects

List of Subjects

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125105/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125106/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Management of Technology

Associate Professor · Tatsuya Deguchi (2 units)

Target〉 About the production management of the automobile industry, it is understood variously from the point of view such as ”research and development”, ”production management”, ”purchasing” and ”quality control” ”marketing” and ”cross-cultural management”.

Outline〉 It learns about the production management. This time, ”the automobile industry” specially takes up the production management of ”Honda Motor Co.,Ltd. (following Honda)” even of that in the case, and the class to appreciate that importance with ranking of technology in management is taken.

Requirement〉 Finish ” Introduction to new business ” or ” Advanced Lecture in management Theory of new business ” .

Notice〉 Face a class when a taking lecture person surely does enough preparation every time. And moreover, be the worst, but one person one time is to do some remarks every time.

Goal〉

1. The elementary knowledge of management is learned.
2. Ranking of the technology in management and that importance are appreciated.
3. It learns how to solve the various problems which always occur in the spot of the management through the case study and the business game.

Schedule〉

1. Guidance
2. Lecture ”What in Management of Technology?”
3. Case report ”Rsearch and development of Honda”
4. Case study ”Plan an overseas factory.” ”A new car development order”
5. Lecture ” Production management and purchasing”
6. Lecture ”Quality control”
7. Case report ”The production management of Honda”,”The supply chain management of Honda”
8. Case study ”Plan an overseas factory.”
9. Case report ”The quality control of Honda”
10. Case study ”Don't make material defects flare up again.”
11. Lecture ”Marketing strategy”
12. Lecture ”Cross-cultural management”
13. Case report ”Around the products project of Honda - the two-wheeled vehicle ”
14. Case report ”The path of internationalization of Honda”
15. Case report ”The personnel management of Honda”
16. Summary and questions and answers

Evaluation Criteria〉 It is evaluated in the remark (20%) in class and the middle, end of a term report (80% in total).

Textbook〉 It doesn't specially use.The summary and so on is distributed every time.

Reference〉 Several are introduced in class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125107/

Student〉 The person who finished ”Introduction to new business” or ” Advanced Lecture in management Theory of new business “ in all the students enrolled in the doctor former term course. And, the number of taking lecture people is restricted to do intensive learning. (20-25 people will be made an upper limit.) It is selected with some means in case of a taking lecture person many.

Note〉 This class invites seven Honda alumnuni who did work in ”research and development”, ”production management”, ”purchasing”, ”quality control”, ”marketing” , ”cross-culutural management”, and so on as an instructor, and it is the class to do case report. Even if it is seen nationwide, the trial done like this is very rare, and it is a precious class. And, an applicant for taking lecture is to attend it in the guidance to hold it in advance.A schedule is indicated separately.

Presentation Method (M)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125108/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (M)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal.
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125109/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (M)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125110/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Advanced Theory of Complex System Engineering

Associate Professor · Tetsushi Ueta, *Executive Director* · Hiroshi Kawakami (2 units)

Target〉 comprehension and application of complex systems by using engineering methodlogies

Outline〉 Complex systems are defined as compound dynamical systems whose behavior and features cannot be predicted because of their nonlinearities and connecting conditions. This emergence of behavior is not possible for a single dynamcal system. therefore, connection, coupling, compounding are keywords of this theory. Emergence of rythm in biological systems, self organization, chaotic properties in high degrees of freedom, lerning and associative memory are example features of complex systems. In this lecture, based on physical systems which are ubiquitously found and treated by system engineering subjects, we study analytical methods to understand these phenomena, bifurcation theory of nonlinear and linear systems, applied extraction methods of valuable information from observed data, system design methods of compound dynamical systems.

Style〉 Lecture

Keyword〉 complex system, bifurcation, chaos, nonlinear phenomena

Fundamental Lecture〉 "Differential Equations (II)"(1.0), "Transient Analysis"(1.0), "Industrial Basic Physics"(1.0)

Relational Lecture〉 "Advanced Theory of System Analysis"(0.5, ⇒211 page), "Topics of mathematical physics"(0.5, ⇒231 page), "Advanced Electrical Control System"(0.5, ⇒207 page), "Advanced Theory of Electronic Circuits"(0.5, ⇒215 page)

Requirement〉 none

Goal〉

1. understanding of the definition and target area of complex systems
2. understanding of qualitative approach for given dynamical system
3. understanding and application of bifurcation theory

Schedule〉

1. examples of complex systems
2. relationship between bifurcation problems and complex systems
3. comptation of bifurcation parameter values
4. chaos and bifurcation phenomenon
5. chaotic itinerary
6. emergence mechanism of spatio temporal chaos and its clustering
7. phase transition and synchronization
8. spatio temporal intermittency and emergence of patterns
9. chaos neural network
10. neuronal circuits as complex systems
11. bifurcations in emergence systems
12. analysis of social systems
13. survey on complex systems
14. exercise 1
15. exercise 2
16. questions and answers

Evaluation Criteria〉 The total grade is evaluated by homework reports (70 %) and attendance of the class. (30 %)

Textbook〉 specified every class.

Reference〉 Chaotic Scenario of Complex Systems, Asakura-Shoten, 1996 (in Japanese)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125118/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Ueta (Ait502, +81-88-656-7501, tetsushi@ait.tokushima-u.ac.jp)
⇒ Kawakami (, +81-88-656-7465, hukugakk@honbu.tokushima-u.ac.jp)

Advanced Theory of Electromagnetic Compatibility

Professor · Katsuo Isaka (2 units)

Target〉 The purpose of this lectrure is to help students understand (1) electromagnetic environments quantitatively, (2) thier electrical effects on the industrial products and (3) their biological effects on humans.

Outline〉 (1) Fundamentals of electromagnetic theory, (2) Electromagnetic compatibility (EMC) of industrial products, (3) Guideline of protection of humans from environmental electromagnetic fields, and (4) Concept of EMC in 21st century.

Style〉 Lecture

Keyword〉 Electromagnetic field, Electromagnetic interference, Electromagnetic immunity

Fundamental Lecture〉 "Advanced Circuit Theory"(0.2, ⇒214 page), "Advanced Theory of Electronic Circuits"(0.2, ⇒215 page), "Advanced Biological Engineering"(0.2, ⇒213 page)

Relational Lecture〉 "Erectric Power System"(0.2, ⇒205 page)

Requirement〉 Good understanding of electromagnetics theory.

Goal〉

1. To be able to understand natural and artificial environments by the theoretical use of electromagnetic fields.
2. To be able to understand the pratice of electromagnetic compatibility design of electric and electronic equipments.
3. To be able to understand the discussions of electromagnetic fields effects on living bodies by international agencies.

Schedule〉

1. Electric field, magnetic field and Electromagnetic field (1).
2. Electric field, magnetic field and Electromagnetic field (2).
3. Electric field, magnetic field and Electromagnetic field (3).
4. Electromagnetic fields in natural environment.
5. Man-made low frequency electromagnetic fields.
6. Low frequency electromagnetic fields in residential and occupational environments.
7. Man-made High frequency electromagnetic fields.
8. Concept of electromagnetic compatibility.
9. Electromagnetic interference and immunity
10. Effects of environmental electromagnetic fields on electronic circuits.
11. Biological effects of electromagnetic fields.
12. Protection of humans from ionizing and non-ionizing electromagnetic fields.
13. Precautionary principle by World Health Organization.
14. Living environments in 21st century and EMC.
15. Review talk and discussions.
16. Examination.

Evaluation Criteria〉 Assignments count 30% and Examination 70%.

Textbook〉 None.

Reference〉 Will be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125119/

Student〉 Any students can attend the class.

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)12:00 to 13:00 Monday through Friday

Note〉 This lecture will be given in English.

Advanced Lecture of E-business

Professor · Yohsuke Kinouchi (2 units)

Target〉 To master key technologies used in e-business and the principles.

Outline〉 Key technologies for e-business are introduced.

Style〉 Lecture

Keyword〉 e-businness, internet

Requirement〉 none

Notice〉 none

Goal〉

1. To get knowledge on e-business
2. To get skills for e-business

Schedule〉

1. e-business
2. Internet and the mechanism
3. Mobile network and the mechanism
4. Network management
5. Security for e-business
6. typical e-business model
7. estabilishment of e-business
8. administration of e-business
9. accounting for e-business
10. customer management in e-business
11. complaints management in e-business
12. Examples of e-business in production areas
13. Examples of e-business in commercial areas
14. Examples of e-business in service areas
15. Example of e-business in social areas
16. Commnents on reports

Evaluation Criteria〉 Evaluated by portfolios and/or examinations

Textbook〉 Printed materials

Reference〉 References will be introduced in the classes.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125120/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kinouchi (, +81-88-656-7475, kinouchi@ee.tokushima-u.ac.jp)

Nuclear Magnetic Resonance

Professor · Takashi Ohno (2 units)

Target〉 This lecture explains principles of nuclear magnetic resonance and introduces its application to solid state physics and chemistry.

Outline〉 Nuclear magnetic moment and its interaction with an external magnetic field are explained babed on quantum mechanics. Some examples of its application to solid state physics and chemistry are introduced.

Style〉 Lecture

Keyword〉 NMR, NMR spectrum, spin - lattice relaxation, Knight shift, Chemical shift

Schedule〉

1. Magnetic moment of nuclei and Boltzmann's distribution
2. Magnetic moment of electron
3. Method for NMR observation
4. Apparatus for NMR meassurement
5. Spin echo and NMR spectrum
6. Spin - lattice relaxation
7. NMR in metals
8. High Tc superconductors
9. NMR and NQR of High Tc superconductors
10. Chemical shift
11. Knight shift
12. NMR in chemistry
13. Magnetism and NMR
14. Superconductors and NMR - NQR
15. Super ionic conductors and NMR

Textbook〉 遍歴電子系の核磁気共鳴 (朝山邦輔著 · 裳華房)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125242/

Contact〉 Takashi Ohno, A201, 656-7549

Engineering of Correlated Electron Matter

Assistant Professor · Yu Kawasaki (2 units)

Target〉 In many solid-state materials, new phenomena evolve due to strong electron interactions. In this Lecture, review will be given on some advanced topics and their applications, including high temperature superconductivity, metal-insulator transition and strongly correlated electronics.

Outline〉 New types of superconducting and magnetic phenomena emerge in correlated electron matters. The term "correlated electron" represents the state of matter where many electrons are strongly interacting with each other. After an introductory talk on magnetism and superconductivity, review will be given on some advanced topics, including high temperature superconductivity, metal-insulator transition and colossalmagneto resistance. Potential application of correlated electron matters to technology is also presented focusing on spintronics or strongly correlated electronics.

Style〉 Lecture

Keyword〉 strongly correlated electron, magnetism, superconductivity, Mott insulator

Goal〉 To understand basic concept of correlated electron matter and its application

Schedule〉

1. Introduction to correlated electron matters
2. Perspectives of magnetism and superconductivity in correlated electron matters
3. Electronic states of atoms and ions
4. Magnetic ions in crystal electric field
5. Diamagnetism and paramagnetism
6. Ferromagnetism and antiferromagnetism
7. Itinerant magnetism
8. Introduction to superconductivity
9. Superconducting phenomenology
10. Electron-phonon interaction
11. How to probe rich properties in correlated electron matters
12. Application of correlated electron matters to technology 1 -perovskite manganese oxides-
13. Application of correlated electron matters to technology 2 -high-Tc superconductors-
14. Application of correlated electron matters to technology 3 -heavy-fermion superconductors-
15. Towards strongly correlated electronics

Evaluation Criteria〉 Reports on several subjects in lecture

Textbook〉 no specific text

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125243/

Topics of mathematical physics

Professor · Shigeaki Nagamachi (2 units)

Target〉 We study the quantum computing.

Outline〉 We study the elementary theory of numbers and group theory in order to understand RSA cryptography based on the difficulty of factorization for a big number. We study the theory of Hilbert spaces and their operators to understand Shor's fast factorization algorithm for quantum computers.

Goal〉 Understanding the principle of quantum computation

Schedule〉

1. Group theory 1
2. Group theory 2
3. Number theory 1
4. Number theory 2
5. RSA cryptography
6. Shor's factirization algorithm 1
7. Hilbert space
8. Operators on Hilbert space
9. Quantum mechanics 1
10. Quantum mechanics 2
11. Quantum information
12. Quantum circuits
13. Quantum Fourier transformation
14. Shor's factorization algorithm 2
15. The complexity of Shor's factorization algorithm
16. Reserve day

Textbook〉 Mika Hirvensalo, Quantum Computing, Springer (2004)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125244/

Topics in topology

Associate Professor · Hiroki Sumida-Takahashi (2 units)

Target〉 We will learn topological space, continuity, and homology groups, which are basic concepts of topology. Further we will learn how to compute the homology groups for simple geometric object.

Outline〉 In this course we will learn basic concepts of topology. Further we will learn how to compute homology groups for simple geometric objects, and their applications.

Keyword〉 topology, homology

Goal〉 We will learn fundamentals of modern abstract mathematics and realize its effectiveness.

Schedule〉

1. Introduction
2. unicursal theorem
3. set and map
4. metric space and topological space I
5. metric space and topological space II
6. topological figure
7. simplex
8. simplicial complex and polyhedron I
9. simplicial complex and polyhedron II
10. homology group I
11. homology group II
12. homology group III
13. application and example I
14. application and example II
15. application and example III

Evaluation Criteria〉 Evaluation will be based on assignments.

Textbook〉 "topology" TAMURA Ichiro, Iwanami-Zensho

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125245/

Contact〉 Sumida-Takahashi (A204, +81-88-656-7542, hiroki@pm.tokushima-u.ac.jp)Monday, 17:00-18:00

Advanced Plasma Engineering

Professor · Kaoru Ohya (2 units)

Target〉 The purpose of the lecture is to give an introduction to the be behavior of plasmas and its treatment.

Outline〉 The elements of plasma physics and chemistry are introduced in this lecture.

Style〉 Lecture and excercise

Keyword〉 plasma, nuclear fusion

Goal〉

1. Understanding on properties of plasmas
2. Understanding on an introduction to theories of plasma physics

Schedule〉

1. Single-particle motions (1)
2. Single-particle motions (2)
3. Single-particle motions (3)
4. Plasma as fluids (1)
5. Plasma as fluids (2)
6. Waves in plasmas (1)
7. Waves in plasmas (2)
8. Waves in plasmas (3)
9. Diffusion and resistivity (1)
10. Diffusion and resistivity (2)
11. Equilibrium and stability (1)
12. Equilibrium and stability (2)
13. Introduction to controlled nuclear fusion (1)
14. Introduction to controlled nuclear fusion (2)
15. Introduction to controlled nuclear fusion (3)
16. Conclusions and future problems

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125246/

Contact〉 Ohya (, +81-88-656-7444, ohya@ee.tokushima-u.ac.jp)

Advanced Theory of Electron Devices

Professor · Yasuo Ohno (2 units)

Target〉 Understanding of deep levels in compound semiconductor electron device performances

Outline〉 Semiconductor device physics for the analyses and design of semiconductor electron devices will be lectured. After teaching basic concepts of band diagram and fermi levels, carrier transport theory and device operation mechanisms will be presented. Various instable phenomena, which limit the device performance, will also be presented with theoretical backgrounds. The topics include, silicon, GaAs and GaN as semiconductor materials, and MOSFET. HEMT and HBT as electron devices. The lecture items are, 1 Band diagram, 2 Electron transport, 3 Short channel effects, 4 Impurity levels, 5 Deep traps, 6 Semi-insulating substrate, 7 HEMT, 8 Side-gating effect, 9 Drain-lag and DLTS, and 10 Surface states and breakdown.

Style〉 Lecture

Keyword〉 band diagram, HEMT

Goal〉 Draw band diagrams including deep levels in non-thermal equilibrium

Schedule〉

1. Band Diagram
2. Thermodynamics of Electron Transport
3. Short Channel Effects
4. Impurity Levels
5. Electrical Performance of Deep Levels
6. Semi-insulating Substrate
7. Hetero Junction Transistors
8. Side-Gating Effect
9. Drain Lag and DLTS
10. Surface Statesand Breakdown Voltage
11. Discussion
12. Midterm Examination
13. Wide-Gap Semiconductors
14. AlGaN/GaN HFET
15. Discussion
16. Term Examination

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125247/

Contact〉 Ohno (, +81-88-656-7438, ohno@ee.tokushima-u.ac.jp)

Note〉 This lecture will be given in English.

Advanced Device Processing

Associate Professor · Yoshiki Naoi (2 units)

Target〉 This cource will covered topics related to device processing engineering and science, in semicondctor and dielectric devices.

Outline〉 Basic subjects such as physical chemistry, vacuum engineering, surface science, crystal growth technology and mesurement methods for device evaluations will be lectured.

Style〉 Lecture

Keyword〉 Device Processing, Surface Physics and Chemistry, Vacuum Engineering

Fundamental Lecture〉 "Advanced Theory of Semiconductors"(1.0, ⇒201 page), "Advanced Theory of Integrated Circuits"(1.0, ⇒216 page)

Relational Lecture〉 "Advance Theory of Electrical and Electronic Materials"(0.5, ⇒200 page)

Goal〉 To understand the physics of the device processing technology.

Schedule〉

1. Semiconductor and devices.
2. Property of vacuum
3. Production of vacuum
4. Pressure measurement
5. Interaction of atoms and molecules with surface
6. Vapor pressure, application to crystal growth using vacuum technology
7. Physisorption and chemisorption
8. Plasma etching
9. Chemical etching and Physical etching
10. Physics of diffraction
11. Electron optics
12. Electron spectroscopy
13. Scanning Electron Microscopy
14. Transmission Electron Microscopy
15. Atomic Force Microscopy
16. Examination

Evaluation Criteria〉 Problem Sets: 50%, Paper: 50%

Textbook〉 none - references will be cited during lectures

Reference〉 S. M. Sze, Physics of Semiconductor Devices, Second Edition (John Wiley & Sons, 1981).

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125248/

Student〉 Able to be taken by only specified class(es)

Contact〉 Naoi (, +81-88-656-7447, naoi@ee.tokushima-u.ac.jp)Th 5:00-6:00PM

Note〉 This lecture will be given in English.

Advance Theory of Electrical and Electronic Materials

Associate Professor · Kikuo Tominaga (2 units)

Target〉 This cource aims to improve the ability to develop new materials by learning the fundamentals of material science and the properties of various electrical and electronic materials.

Outline〉 Material science of metals, oxide semiconductors, supercondutors, magnetic materials, dielectric materials are lectured for the students of electrical and electronic engineering. The fundamentals of these materials are explained at first as basic knowledge. Oxide semiconductors, superconductor, ferroelectric materials, ferromagntetic materials and ferrite are included. Dielectric and magnetic materials are stressed here. General outline of those materials are given at first . After that, magnetization mechanism of ferromagnetics and various properties of dielectrics are discussed mostly at the view-points of both solid state physics and applications. 1. Solid state physics of metals, 2. oxide semiconductors and transparent conductive oxides, 3.super conductors, 4. dielectrics and ferroelectric materials, 5. magnetization of the substance and magnetic domain structure, 6. ferrite and recent magnets, 7. piezoelectric materials and applications, 8. optoelectronics materials such as CCD, laser, and displays.

Style〉 Lecture and excercise

Keyword〉 Material science, Electrical and Electronic Engineering, dielectric material, magnetic material, semiconductor materials

Relational Lecture〉 "Advanced Theory of Semiconductors"(0.5, ⇒201 page), "Advanced Device Processing"(0.5, ⇒199 page), "Advanced Optoelectronic Devices"(0.5, ⇒202 page)

Goal〉 Understand the fundamentals in material science for electricaal and electronic engineering.

Schedule〉

1. Solid state physics of metals
2. Solid state physics of oxide semiconductors
3. Transparent conductive oxide films
4. Physics of superconductor
5. Superconductors and their applications
6. Paradielectric materials
7. Various properties of ferroelectric materials
8. Magnetization of the substance
9. Ferromagnetic materials
10. Ferrite
11. Recent magnets(bond magnets)
12. Piezoelectric materials
13. Application of piezoelectric materials
14. Optoelectronic materials (1)(CCD, laser materials)
15. Optoelectronic materials (2)(display materials)
16. Exercise

Evaluation Criteria〉 Examination for each theme.

Textbook〉 Electrical and Electronic Materials, Tadashi Shiosaki, Kyouritsu Shuppan (in Japanese)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125249/

Student〉 Able to be taken by only specified class(es)

Contact〉 Tominaga (, +81-88-656-7439, tominaga@ee.tokushima-u.ac.jp)Thursday and Friday, pm.17:00-18:30

Note〉 This lecture is carried out by the use of power point. Prepare electronic memory for the study in home.

Advanced Theory of Semiconductors

Associate Professor · Katsushi Nishino (2 units)

Target〉 To understand semiconductor physics and fundamental device operations for various semiconductor devices

Outline〉 Semiconductor physics, especially behavior of carriers in semiconductor, is described. Properties of pn junction and Schottky barrier, including non-ideal case, are also lectured.

Style〉 Lecture

Keyword〉 Semiconductor, Metal-semiconductor contact, pn junction diode

Relational Lecture〉 "Advanced Device Processing"(0.5, ⇒199 page), "Advanced Theory of Electron Devices"(0.5, ⇒198 page), "Advanced Optoelectronic Devices"(0.5, ⇒202 page)

Goal〉

1. To understand behavior of carries (such as scattering mechanisms) in semiconductor
2. To solve diffusion equations in simple conditions
3. To understand properties of pn junction and Schottky barrier

Schedule〉

1. Crystal Structure
2. Energy Bands
3. Carrier Concentration at Thermal Equilibrium
4. Carrier Transport
5. Phonon
6. High-Field Effect
7. Continuity Equations and Diffusion Equations of Carriers
8. Band Structure of Metal-Semiconductor Contact
9. Current Transport Processes of Schottky Barrier
10. Charcterization of Schottky Barrier Height
11. Ohmic Contact
12. Band Structure of pn Junction Diode
13. Capacitance-Voltage Characteristics of pn Junction Diode
14. Current-Voltage Characteristics of pn Junction Diode
15. Heterojunction
16. Examination

Evaluation Criteria〉 Report 50%, Examination 50%. More than 60% is required to pass this class.

Textbook〉 Physics of Semiconductor Devices, by S.M.Sze

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125250/

Contact〉 Nishino (, +81-88-656-7464, nishino@ee.tokushima-u.ac.jp)

Advanced Optoelectronic Devices

Professor · Shiro Sakai (2 units)

Target〉 Understanding of opt-electronic devices

Outline〉 I lecture on an optical amplification and its effect on a semiconductor laser and optical properties of semiconductors. Carrier and light confinements, reflection and guided mode stripe lasers, and the quantum confinement hetero-structure lasers are explained. Reports are required in each of the step, and it is bases of final grade. Lecture schedule are follows. 1. Optical confinement and wave-guide. 2. v-b curves and effective index. 3. Einstein's relation in a semiconductor and black body radiation. 4. Semiconductor light absorption, spontaneous and stimulated emission. 5. Matrix element and density of state of a semiconductor. 6. Optical amplification and the various model calculation in a semiconductor. 7. Optical amplification and semiconductor lasers. 8. The design of a semiconductor laser. 9. The growth of a semiconductor laser. 10. Summary.

Keyword〉 Laser, Semiconductor, Light confinement

Requirement〉 Students are required to have a good understand undergraduate level physics of semiconductor.

Goal〉 To understand of the opto-electronic semiconductors

Schedule〉

1. Optical confinement and wave-guide.
2. v-b curves and effective index 1.
3. v-b curves and effective index 2.
4. Einstein's relation in a semiconductor and black body radiation.
5. Semiconductor light absorption, spontaneous and stimulated emission.
6. Matrix element and density of state of a semiconductor 1.
7. Matrix element and density of state of a semiconductor 2.
8. Optical amplification and the various model calculation in a semiconductor 1.
9. Optical amplification and the various model calculation in a semiconductor 2.
10. Optical amplification and semiconductor lasers 1.
11. Optical amplification and semiconductor lasers 2.
12. The design of a semiconductor laser 1.
13. The design of a semiconductor laser 2.
14. The growth of a semiconductor laser 1.
15. The growth of a semiconductor laser 2.
16. Summary.

Evaluation Criteria〉 Report 40, Test 60, Total 100. Above 60 pass the examination.

Textbook〉 Diode lasers and photonic integrated circuits,by L.A.Coldren, S.W.Corzine, John Wiley & sons, Inc., (1995) ISBN 0-471-11875-3

Reference〉 Hetero-struructure lasers,by H.C.Casey,Jr, M.B.Panish, Academic Press , (1978), ISBN 0-12-163101

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125251/

Contact〉 Sakai (, +81-88-656-7446, sakai@ee.tokushima-u.ac.jp)

Advanced Theory of Optelectronics

Professor · Kazuhito Tajima (2 units)

Target〉 The purpose of this class is to understand principles of new optical devices based on optical nonlinearities.

Outline〉 Principles of optical fiber communication and new optical devices based on optical nonlinearities are introduced in this class.

Style〉 Lecture

Keyword〉 optical fiber, optical device, optical communications

Goal〉

1. understand principles of optical fiber communications
2. understand optical nonlinearities
3. understand principles of nonlinear optical devices
4. understand application methods of nonlinear optical devices

Schedule〉

1. linearities of single mode optical fibers(2 weeks)
2. Soliton effects in single mode optical fibers(2 weeks)
3. optical devices (2weeks)
4. Various nonlinearities in semoconductors and their comparison.(2weeks)
5. All optical devices based on semiconductor and differential phase modulation(2weeks)
6. Limitting factors of semiconductor all-optical devices(2weeks)
7. Application to optical communications(3weeks)
8. Examination

Evaluation Criteria〉 Examinations and portfolios

Textbook〉 Printed materials

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125252/

Student〉 Able to be taken by only specified class(es)

Contact〉 Tajima (, +81-88-656-9716, tajima@ee.tokushima-u.ac.jp)

Note〉 Since he is sick taking a rest, you have to check whether a course is opened.

Advanced High Voltage Engineering

Associate Professor · Naoyuki Shimomura (2 units)

Target〉 It doesn't stay in the field of electric power engineering and the knowledge of the high voltage and large-current engineering is acquired. The latest use of the high voltage and large-current technology and the application will be learned.

Outline〉 The high-voltage engineering the large-current engineering has supported industries and the electric energy engineering and is still developing. In this lecture, the various physical phenomena involved in high voltage and large current as well as the phenomena of discharges and the characteristics of insulators are described in detail. Moreover, it lectures on the technology of the generation and the diagnostics of the high voltage and so on including the latest technology. In its applications, the new technology and application rather than the electric power system are introduced, as pulsed power and inertia confinement fusion. The current or upcoming topics such as environmental applications and medical applications will be discussed in the class.

Style〉 Lecture and excercise

Keyword〉 High voltage, Large current, Pulsed poewr

Fundamental Lecture〉 "High Voltage Engineering"(1.0)

Goal〉

1. To understand fundermental phenomena of the discharge and mechanisms of the insulation
2. To understand fundamental phenomena of large current

Schedule〉

1. The recent trends of technologies on high voltage and large current
2. The recent trends of pulsed power technologies and their applications
3. The state-of-the-art technologies for pulsed power (12wks)
4. Term-end exam
5. The exposition about the exam

Evaluation Criteria〉 Participation and presentation:50%; Final examination:50%

Textbook〉 None

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125253/

Student〉 Able to be taken by student of other department

Contact〉 Shimomura (, +81-88-656-7463, simomura@ee.tokushima-u.ac.jp)

Note〉 Language in this subject may be English.

Erectric Power System

Professor · Kiyoshi Inoue (2 units)

Target〉 Based on the fundamental knowledge of erectric power system engineering, detailed understanding on electric-magnetic environments around the power transmission system are expected through this lecture. Superconducting electrical machines, such as superconducting power transmission cable, SMES, superconducting generator, superconducting current limiter, and superconducting transformer, are expected to be incorporated in the practical power transmission system, of which influences are also lectured.

Outline〉 Considering through the general characteristics of AC and DC power transmission system and its history of level-up of transmission voltage, detailed understanding on the rapid development of power transmission system in past-100 years, and in future are expected. The future power transmission system is expected to be concerned with the superconducting facilities, as a superconducting power transmission cable. Considering the historical developments of power transmission system, transmission system materials, and superconducting materials, this lecture is performed. The analytical and measurering methods of the electro-magnetic fields around the power transmission facilities and the superconducting facilities are also included in this lecture. The lecture is one of the technological lectures including (1) the general characteristics of AC, DC and superconducting power transmission systems, (2) The history and future of power transmission system with large capacity, (3) the insulation reliability of insulator, oil, and cryogen, (4) the superconducting machines, and (5) the analytical and measurering methods of the electric and magnetic fields.

Keyword〉 superconductivity

Goal〉

1. Analysis of electric power, frequency, and voltage in transmission system can be performed.
2. Electro-magnetic field around power transmission lines and superconducting facilities can be understood.
3. Superconductive applications to power transmossion systems can be understood.

Schedule〉

1. Characteristics of effective elctric power and reactive electric power.
2. Stability of frequency and voltage
3. Superconducting power cable
4. Comparison of DC and AC power cable.
5. Influence of superconducting generator on electric power system.
6. Problems on long-length cryogenic cooling.
7. Characteristics of electric fields from the power systems and the superconducting facilities.
8. Charactersistcs of magnetic fields from the power transmission systems and the superconducting facilities
9. Protection facilities for the power system and the superconducting facilities.
10. Stability of the superconducting facilities
11. Erectro-magnetic field effects on a living body
12. Superconducting transformar, superconducting current limitter, and SMES.
13. Progress on the materials in electric power system
14. Thermal insulation and electric insulation.
15. Magnetic field shield.
16. Conclusions and report

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125254/

Contact〉 Inoue (B-7, +81-88-656-7462, inouek@ee.tokushima-u.ac.jp)Monday 13:30 - 17:30, Wednesday 13:30 - 17:30

Advanced Theory of Electric Power Engineering

Associate Professor · Masatake Kawada, *Part-time Lecturer* · Kensuke Kawasaki, · Kiyoshi Takigawa (2 units)

Target〉 To give the students understanding of the principles and the trends of technologies used in electric power engineering and the related environmental aspects. To improve the oral presentation skill of students by presenting the latest transaction or journal papers in this field in English.

Outline〉 This course presents the principles and trends of technologies used in electric power engineering and the related environmental aspects. Students are required to present the latest transaction or journal papers in this field in English.

Style〉 Lecture and excercise

Keyword〉 Electromagnetics, Electrical Circuits

Relational Lecture〉 "Advanced Theory of Electromagnetic Compatibility"(0.5, ⇒191 page), "Erectric Power System"(0.5, ⇒205 page), "Advanced High Voltage Engineering"(0.5, ⇒204 page)

Requirement〉 Prerequisites: electrical power engineering, energy engineering or equivalent in undergraduate.

Goal〉

1. To understand the principles and the trends of technologies used in electric power engineering
2. To understand the environmental aspects of electric power engineering

Schedule〉

1. Principles of electric power engineering 1
2. Principles of electric power engineering 2
3. Materials in electric power engineering
4. Instrumentation in electric power engineering
5. Generators
6. Transformers
7. Switchgear
8. Cable
9. Power system
10. Power quality and electromagnetic compatibility
11. Presentation of surveyed transaction or journal papers 1
12. Presentation of surveyed transaction or journal papers 2
13. Presentation of surveyed transaction or journal papers 3
14. Presentation of surveyed transaction or journal papers 4
15. Examination
16. Return of examination and conclusion

Evaluation Criteria〉 Final examination 50%, Presentation 50% Attendance and participation in class is essential.More than 60 % is required to pass this class.

Textbook〉 D.F. Warne , Electrical Power Engineer's Handbook second edition, Newnes

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125255/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kawada (, +81-88-656-7460, kawada@ee.)Wednesday 16:00-17:00, Thursday16:00-17:00

Note〉 Language: English

Advanced Electrical Control System

Professor · Takuya Kamano, *Associate Professor* · Takashi Yasuno (2 units)

Target〉 This class introduces the basic principle of making to high performance and the intelligence in control system used for an industrial machine. And the control design of various control systems is understood.

Outline〉 The control system configuration used for the industrial machine is described, and applications of intelligent control method using fuzzy reasoning and neural net works are introduced. Moreover, Current topics of fields mentioned avobe are introduced.

Style〉 Lecture and excercise

Keyword〉 Motion Control, Fuzzy Reasoning, Neural Network

Relational Lecture〉 "Advanced Lecture of Intelligent Information Processing"(0.5, ⇒217 page), "Advanced Control Theory"(0.5, ⇒210 page)

Goal〉

1. The congfiguration of the control system used for an industrial machine should be understood.
2. The intelligent control method should be understood.

Schedule〉

1. Control object
2. Feedback control and feedforward control
3. Two degree-of-freedom control
4. Analysis of control system
5. Control method 1 of feedback control
6. Control method 2 of feedback control
7. Design criterion of feedforward controller
8. Fuzzy sets
9. Fuzzy reasoning
10. Control sysytem application of fuzzy reasoning
11. Artificial neural network
12. Neural network
13. Learning algorithm
14. Control system application of neural networks
15. Conclusions
16. Return of report or examination

Evaluation Criteria〉 Total evaluation based on Reports or examinations

Textbook〉 The print is distributed.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125256/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Kamano (, +81-88-656-7455, kamano@ee.tokushima-u.ac.jp)
⇒ Yasuno (, +81-88-656-7458, yasuno@ee.tokushima-u.ac.jp)Monday, 15:00-17:30

Electromechanical Systems

Associate Professor · Ikuro Morita (2 units)

Target〉 The purpose of Electromechanical System is to understand the conceptual philosophy of new ac machine drive systems, which are found in a vast number of industries.

Outline〉 We discuss the mathematical modeling techniques of ac machines in the various reference frames, the vector control method using these modeling techniques and the sensorless control methods. Furthermore we introduce the configurations of power converter and the architectures of the control systems embedded the micro-controller LSI and DSP chips. By simulation analysis using "Mathematica" and "MATLAB" in the first half, and through the practical designs in the second half, the more theoretical and practical understandings are expected.

Style〉 Lecture and excercise

Keyword〉 dq transformation, synchronous motor, induction motor, vector control, sensorless control

Relational Lecture〉 "Advanced Power Electronics"(0.3, ⇒209 page)

Requirement〉 Prerequisites (preferable) : "Eectrical machines (I),(II)" ,"Power electronics" and "Electrical machine dynamics and controls" in undergraduate.

Goal〉 To understand the conceptual philosopy of new ac machine drive control systems

Schedule〉

1. Modeling of synchronous motors.
2. Modeling of indction motors.
3. Vector control of synchronous motors.
4. Vector control of induction motors (1).
5. Vector control of induction motors (2).
6. Sensorless vector control of synchronous motors.
7. Sensorless vector control of induction motors (1).
8. Sensorless vector control of induction motors (2).
9. Inverter circuits for ac motor drives.
10. LSI for ac motor drive controls.
11. DSP for ac motor drive controls.
12. Configuration of ac motor drive controls system (1).
13. Configuration of ac motor drive controls system (2).
14. Sum-up and conclusions.
15. Final examination.
16. Review of final examination.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125257/

Student〉 Able to be taken by only specified class(es)

Contact〉 Morita (, +81-88-656-7451, morita@ee.tokushima-u.ac.jp)

Advanced Power Electronics

Professor · Tokuo Ohnishi (2 units)

Target〉 To understand and learn application technologies of power conversion control circuit using switching power devices.

Outline〉 Basic power electronics covers the basic operation and its characteristics of the static power conversion circuit by using switching power devicies. In the advanced power electronics, how to generate the switching control signal for these power conversion circuit ,how to construct the control system and how to apply the power converter to many apparatus are lectured and disccused . Subjects are as follows;harmonics analysis,rotating axes transformation,instantaneous active and reactive power, PWM control methds, Sinusoidal PWM control,PFC converter,interconnected inverter,active filter,reactive power compensator, sensorless controls.

Keyword〉 Inverter, Power supply, Motor drive, Utility interconnection

Fundamental Lecture〉 "Power Electronics"(1.0), "Electrical Machines (1)"(1.0), "Electrical Machines (II)"(1.0)

Relational Lecture〉 "Electrical Machine Dynamics and Controls"(0.5), "Electrical Machine Dynamics and Controls"(0.5)

Requirement〉 Prerequisites: power electronics in undergraduate

Goal〉

1. Ability of theoretical analysis
2. Understanding the control operation of application circuit
3. Understanding the control system of application circuits
4. Understanding the operation of control systems

Schedule〉

1. Harmonics analysis
2. Rotating axes transformation
3. Instantaneous active power and instantaneous reactive power
4. PWM switching methods
5. Sinusoidal PWM inverter
6. Power factor correction converter
7. Midterm test
8. Utility interconnecting inverter
9. Active power filter
10. Reactive power compensator
11. Variable speed control of DC motors
12. Variable speed control 1 of AC motors
13. Variable speed control 2 of AC motors
14. Application of power conversion for renewable energy
15. Final test
16. Explanation of the test and check of the results

Evaluation Criteria〉 Final examination 50%, Presentation (Participation) 50%

Textbook〉 None (Prints)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125258/

Contact〉 Ohnishi (, +81-88-656-7456, ohnishi@ee.tokushima-u.ac.jp)

Advanced Control Theory

Associate Professor · Tomohiro Kubo (2 units)

Target〉 The purpose of this lecture is to explain the design theory of control systems based on the state space method.

Outline〉 The state space method describes the dynamics of systems with the state equation, and it has a merit that it can deal with multi-input multi-output systems as well as single-input single-output systems. In this lecture, among the design methods belonging to the state space method, the linear-quadratic regulator and pole assignment are demonstrated.(lecture style)

Style〉 Lecture

Keyword〉 linear-quadratic regulator, pole assignment method

Fundamental Lecture〉 "Basic Theory of Systems"(1.0)

Relational Lecture〉 "Control Theory (II)"(0.5), "Control System Design"(0.5, ⇒440 page)

Requirement〉 Basic knowledge about the linear algebra is required to attend this lecture.

Notice〉 Take notes carefully.

Goal〉

1. To understand the notion of the system structure in the state space method
2. To master the design method of the linear-quadratic regulator

Schedule〉

1. What is the linear-quadratic regulator?
2. Determinant and inverse of matrix
3. Eigenvalues, eigenvectors and diagonalization of matrix
4. Quadratic form and positive definiteness
5. Necessary and sufficient condition for the controllability
6. Observability and duality
7. State variable transformation and equivalence
8. Diagonal canonical form
9. Controllability canonical form
10. Lyapunov function and the stability of systems
11. Constructing the linear-quadratic regulator
12. Stability of the closed loop system
13. Optimality of the control law
14. Solving Riccati equation
15. Pole assignment method
16. Examination

Evaluation Criteria〉 Mainly by the examination.

Textbook〉 Not used.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125259/

Contact〉 Kubo (, +81-88-656-7466, kubo@ee.tokushima-u.ac.jp)

Advanced Theory of System Analysis

Executive Director · Hiroshi Kawakami (2 units)

Target〉 Modeling, analysis method and design method of dynamical systems are introduced in this lecture.

Outline〉 An analytical method of linear lumped constant systems is introduced in this lecture. Also, various nonlinear phenomena and the qualitative analysis method are explained. Futhermore, relationship between linear systems and nonlinear ones are discussed in this lecture.

Goal〉

1. Understand behaviors of linear systems
2. Understand behaviors of nonlinear systems and the qualitative analysis method.

Schedule〉

1. Dynamical systems and mechnics system models(2weeks)
2. Components in mechnics systems
3. Classification of components in mechanics systems(2weeks)
4. Equilibria and their stability(3weeks)
5. Fixed points of discrete time systems and their stability(2weeks)
6. Analytic approach for periodic solutions
7. Biburcations
8. Chaotic state
9. linear phenomenon and nonlinear ones
10. summary and examination

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125260/

Contact〉 Kawakami (, +81-88-656-7465, hukugakk@honbu.tokushima-u.ac.jp)

Advanced Theory of Electrical Communication

Professor · Tadamitsu Iritani, *Assistant Professor* · Takahiro Oie (2 units)

Target〉 Understanding analysing techniques of the communication system and multi-nodes networks.

Outline〉 The purpose of communication theory is to analyze the transmission of information-bearing signal via communication channels. The lecture is concerned with the study of digital communication. Fundamental mathematics for digital communication, pulse code modulation, basic digital modulation/demodulation techniques for baseband and carrier transmission are discussed in this lecture. Furthermore, as an example of digital communication, we discuss architecture and implementation of computer networks. (Lecture style)

Style〉 Lecture

Keyword〉 digital communication, computer networks, network architecture

Fundamental Lecture〉 "Communication Systems"(1.0), "Applied Communication Engineering"(1.0), "Computer Networks"(1.0)

Requirement〉 Students are required to have a good understanding of undergraduate-level communication engineering and related subjects.

Goal〉

1. Understanding the analysing techniques of the communication system.
2. Understanding the control techniques and implementation of computer network application.

Schedule〉

1. Overview of digital communication
2. Mathematical preparation
3. Coding and decoding
4. Pulse code modulation
5. Baseband modulation
6. Carrier modulation
7. Error correction and control
8. Network architecture
9. Physical layer and datalink layer
10. Network layer and routing
11. Transport layer
12. Traffic control
13. Session, presentation and application layer
14. Implementation example of application layer (part 1)
15. Implementation example of application layer (part 2)

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125261/

Student〉 Able to be taken by only specified class(es).

Contact〉

⇒ Iritani (, +81-88-656-7478, iritani@ee.tokushima-u.ac.jp)
⇒ Oie (E-3F-C-1, +81-88-656-7479, alex@ee.tokushima-u.ac.jp)Monday 16:20~ 17:20, Thursday 16:50~ 17:50

Advanced Biological Engineering

Professor · Yohsuke Kinouchi, *Assistant Professor* · Masatake Akutagawa (2 units)

Target〉 Understanding modeling and clarification of biological functions and their applications on engineering.

Outline〉 This lecture introduces fundamental technolgies to apply engineering technologies for medical field, such as, diagnoses, treatment and function substitution; growth of engineering based on biological mechanisms; functional characteristics of biological systems and their information processing basics of application for control. The topics are 1. physiological characteristics of biological system, 2. biological measurement, 3. medical equipments for diagnosis or treatment, 4. equipments for replacement or assistance of biological functions, 5. functions of nerve system, 6. applications of artificial neural networks.

Style〉 Lecture

Goal〉

1. Understanding of modeling of biological neural network function and its analysis
2. Understanding of modeling of biological control system and its analysis
3. Understainding of modeling of biological sensory system

Schedule〉

1. Physiological functions of a neuron and their mathematical models
2. Modeling of neural networks
3. Functional analysis of artificial neural networks
4. Applicaions of artificial neural networks on engineering
5. Signal processing using artificial neural networks
6. Exercise in neural networks
7. Various modeling of neural networks
8. Modeling of biological control scheme
9. Analysis of biological control scheme
10. Information processing in biological visual system
11. Information processing in biological auditory system
12. Introduction of biosensors
13. Physiome

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125262/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Kinouchi (, +81-88-656-7475, kinouchi@ee.tokushima-u.ac.jp)

⇒ Akutagawa (, +81-88-656-7477, makutaga@ee.tokushima-u.ac.jp)Wed. 17:00 - 18:00, Fri. 17:00 - 18:00

Note〉 This lecture will be given in English.

Advanced Circuit Theory

Associate Professor · Yoshifumi Nishio (2 units)

Target〉 Analysis method of nonlinear circuits, and behavior of nonlinear oscillatory circuits and its applications are lectured.

Outline〉 Modeling of nonlinear devices, DC analysis and transient analysis of nonlinear circuits, and steady-state analysis are lectured. Synchronization and chaotic phenomena in nonlinear oscillatory circuits are introduced and their applications to information and communication engineering are discussed. (Style: Lecture)

Style〉 Lecture and excercise

Keyword〉 Nonlinear circuits, Circuit analysis, Oscillatory circuits

Fundamental Lecture〉 "Electrical Circuit Theory (I) and Exercise"(0.7), "Electrical Circuit Theory (II) and Exercise"(0.5), "Network Analysis"(0.3)

Relational Lecture〉 "Advanced Theory of Complex System Engineering"(0.5, ⇒190 page), "Advanced Theory of System Analysis"(0.5, ⇒211 page)

Requirement〉 Students are required to know how to analyze basic linear circuits.

Notice〉 Course is taught in English.

Goal〉

1. Understanding of analysis methods of nonlinear circuits.
2. Understanding of behavior of nonlinear circuits and its applications.

Schedule〉

1. Modeling of nonlinear devices.
2. DC analysis of nonlinear circuits by Newton method.
3. Transient analysis of nonlinear circuits.
4. Steady-state analysis of nonlinear circuits (for 4 lectures).
5. Synchronization phenomena in nonlinear oscillatory circuits (for 2 lectures).
6. Chaotic phenomena in nonlinear oscillatory circuits (for 2 lectures).
7. Engineering applications of nonlinear circuits (for 4 lectures).
8. Conclusions and final examination.

Evaluation Criteria〉 Final examination 80% and exercise 20%.

Textbook〉 None.

Reference〉

- ◇ Akio Ushida and Mamoru Tanaka, "Nonlinear Circuit Simulations," Corona Publishing Co.
- ◇ S. Smale and M.W. Hirsch, "Differential Equations, Dynamical Systems, and Linear Algebra," Academic Press.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125263/

Student〉 Able to be taken by only specified class(es)

Contact〉 Nishio (D-7, E-3F-South, +81-88-656-7470, nishio@ee.tokushima-u.ac.jp)

Advanced Theory of Electronic Circuits

Professor · Masaki Hashizume, *Associate Professor* · Hiroyuki Yotsuyanagi (2 units)

Target〉 The purpose of this lecture is to understand advanced theory and the state-of-the-art technology for the IC implementation.

Outline〉 Electronic circuits have been implemented as ICs. This lecture introduces advanced theories and the state-of-the-art technologies for the IC implementation. The following are the topics: 1. Analysis and synthesis of logic circuits, 2. Integrated digitail circuits, 3. Analysis and synthesis of analog circuits, 4. Integrated analog circuits, 5. Low power digital circuits

Style〉 Lecture in combination with Portfolio

Keyword〉 electronic circuits, IC implementation, integrated circuits, circuit design

Fundamental Lecture〉 "Electronic Circuits"(1.0), "Computer Circuits"(1.0)

Relational Lecture〉 "Advanced Theory of Integrated Circuits"(0.3, ⇒216 page)

Requirement〉 Familiarity with electric circuit and IC technology

Goal〉 To understand advanced theories and the state-of-the-art technologies for IC implementation of electronic circuits.

Schedule〉

1. Introduction of related topics
2. The state-of-the-art technologies for IC implementation (13wks)
3. Examination
4. The exposition about the examination

Evaluation Criteria〉 Attendance and presentation:30%; Final examination:70%

Textbook〉 specified in the first class

Reference〉 introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125264/

Student〉 Able to be taken by student of other department

Contact〉

⇒ Hashizume (, +81-88-656-7473, tume@ee.tokushima-u.ac.jp)
⇒ Yotsuyanagi (, +81-88-656-9183, yanagi4@ee.tokushima-u.ac.jp)

Note〉 This lecture will be given in English.

Advanced Theory of Integrated Circuits

Professor · Shinsuke Konaka (2 units)

Target〉 To understand the CMOS analog circuit designs for RF-CMOS integrated circuit applications. To understand the logic LSI design by introducing a case study of the previous development of high speed bipolar logic LSIs for a Gb/s optical Tx/Rx and a super-computers.

Outline〉 Main integrated circuit technologies are recently CMOS integrated circuits because of their low power dissipation, low voltage operation and high noise margin. Owing to the continuous scaling down, CMOS operation speed is improved to up to some GHz regions. The purposes of this lecture are to introduce CMOS analog circuit designs and a case study of the previous high speed logic LSIs for multi-Gb/s applications.

Style〉 Lecture and excercise

Keyword〉 analog circuits, CMOS, circuit design

Fundamental Lecture〉 "Advanced Theory of Electron Devices"(1.0, ⇒198 page)

Relational Lecture〉 "Advanced Theory of Electronic Circuits"(0.5, ⇒215 page)

Goal〉

1. To understand MOS transistor models and device parameters for CMOS analog circuit design.
2. To understand CMOS single-ended amplifier, differential amplifier and current mirror circuits.
3. To understand high performance LSI designs by reviewing previous development samples of high speed logic LSIs

Schedule〉

1. A review of integrated circuits and basic MOS transistors
2. CMOS process flow and second-order effects of MOS transistor
3. MOS Circuit models and device parameters of MOS transistors
4. Current-voltage characteristics of MOS transistor
5. Common-source single stage MOS amplifier
6. Common-source stage with source degeneration MOS amplifier
7. Designing common-source stage MOS amplifier
8. Common-gate stage MOS amplifier
9. Common-drain stage MOS amplifier
10. Differential MOS amplifier
11. Gilbert cell circuit
12. Current mirror circuit
13. High speed logic LSI using differential circuits (development example)
14. High speed macro-cell array logic LSI (development example)
15. Example of system LSI
16. Examination

Evaluation Criteria〉 Examination is 70% and reports are 30%. The passing score is not less than 60%.

Textbook〉 Design of Analog CMOS Integrated Circuits, Behzad Razavi, McGrow-Hill, ISBN 0-07-118815-0

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125265/

Advanced Lecture of Intelligent Information Processing

Professor · Seishi Kitayama, *Associate Professor* · Takashi Shimamoto (2 units)

Target〉 Mathematical preliminaries for information processing, basic concept of algorithm and data structure, design and analysis of algorithm, and complexity theory are shown.

Outline〉 For example of these topics, we discuss some problems and algorithms in areas of the layout design and verification of VLSI CAD.

Style〉 Lecture and excercise

Keyword〉 algorithm, data structure, CAD, VLSI layout design

Fundamental Lecture〉 "Computer Algorithm and Data Structure"(1.0)

Goal〉

1. To understand importance of algorithm and data structure.
2. To understand some optimization technique in VLSI layout design.

Schedule〉

1. Introduction to optimization problem
2. Importance of algorithm and data structure
3. CAD of VLSI layout design
4. Floorplan algorithms (2 weeks)
5. Placement algoritms (2 weeks)
6. Global routing algorithms (2 weeks)
7. Detail routing algorithms (2 weeks)
8. Layout compaction algorithms (2 weeks)
9. Layout verification (2 weeks)
10. Examination

Evaluation Criteria〉 Unit evaluation contains examination 80% and exercise 20%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125266/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Kitayama (, +81-88-656-7482, kitayama@ee.tokushima-u.ac.jp)
⇒ Shimamoto (, +81-88-656-7483, simamoto@ee.tokushima-u.ac.jp)

Electrical and Electronic Engineering Seminar and Exercise

Teacher of course (4 units)

Target〉 To get wide knowledge on your reaserach topics.

Outline〉 Students read scientific papers relating to your research and get wide knowledge on your reaserach topics.

Style〉 Lecture in combination with Portfolio

Keyword〉 reading references, presentation skill, discussion

Requirement〉 N/A

Goal〉

1. To get skills to collect scientific references and knowledge relating your research topic
2. To get skills on discussion about a scientific topic
3. To get presentation skills

Schedule〉

1. Continure the followings.
2. Select text books and/or collect references.
3. Summarize the contents of a reference and/or a text book and presnet them.
4. Discuss about the contents of the presentation.

Evaluation Criteria〉 Evaluated with portfolios and/or examinations

Textbook〉 Text books and references will be specified by your supervisors at the first class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125270/

Student〉 Able to be taken by only specified class(es)

Electrical and Electronic Engineering Labolatory

Teacher of course (6 units)

Target〉 To obtain wide knowledge on your research topics by experiments.

Outline〉 Do experiments relating your Master Degree's thesis.

Style〉 Portfolio

Keyword〉 research skill, Acquisition of professional knowledge, presentation skill

Requirement〉 N/A

Notice〉 N/A

Goal〉

1. To acquisite professional knowlege on your research topics by experiments
2. To get presentation skills

Schedule〉

1. Continure the followings
2. Plan your experiments and collect basic knowledge
3. Do experiments according to your plan
4. Summarize experimental results, present them and discuss about them.

Evaluation Criteria〉 Evaluation with portfolios

Textbook〉 Text bools will be introduced by your supervisor at the beginning.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125271/

Student〉 Able to be taken by only specified class(es)

Systems Innovation Engineering — Electrical and Electronic Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Management of Technology ..... WEB page, CMS
  - Presentation Method (M) ..... WEB page, CMS
  - Internship (M) ..... WEB page, CMS
  - Venture Business (M) ..... WEB page, CMS
- *Common Subjects*
  - Advanced Theory of Complex System Engineering ..... WEB page, CMS
  - Advanced Theory of Electromagnetic Compatibility ..... WEB page, CMS
  - Advanced Lecture of E-business ..... WEB page, CMS
- *Basic Departmental Subjects*
  - Nuclear Magnetic Resonance ..... WEB page, CMS
  - Engineering of Correlated Electron Matter ..... WEB page, CMS
  - Topics of mathematical physics ..... WEB page, CMS
  - Topics in topology ..... WEB page, CMS
- *Applied Departmental Subjects*
  - Advanced Plasma Engineering ..... WEB page, CMS
  - Advanced Theory of Electron Devices ..... WEB page, CMS
  - Advanced Device Processing ..... WEB page, CMS
  - Advance Theory of Electrical and Electronic Materials ..... WEB page, CMS
  - Advanced Theory of Semiconductors ..... WEB page, CMS
  - Advanced Optoelectronic Devices ..... WEB page, CMS
  - Advanced Theory of Optelectronics ..... WEB page, CMS
  - Advanced High Voltage Engineering ..... WEB page, CMS
  - Erectric Power System ..... WEB page, CMS
  - Advanced Theory of Electric Power Engineering ..... WEB page, CMS
  - Advanced Electrical Control System ..... WEB page, CMS
  - Electromechanical Systems ..... WEB page, CMS
  - Advanced Power Electronics ..... WEB page, CMS
  - Advanced Control Theory ..... WEB page, CMS
  - Advanced Theory of System Analysis ..... WEB page, CMS
  - Advanced Theory of Electrical Communication ..... WEB page, CMS
  - Advanced Biological Engineering ..... WEB page, CMS
  - Advanced Circuit Theory ..... WEB page, CMS
  - Advanced Theory of Electronic Circuits ..... WEB page, CMS
  - Advanced Theory of Integrated Circuits ..... WEB page, CMS
  - Advanced Lecture of Intelligent Information Processing ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Electrical and Electronic Engineering Seminar and Exercise ..... WEB page, CMS
  - Electrical and Electronic Engineering Labolatory ..... WEB page, CMS

Systems Innovation Engineering — Information Science and Intelligent Systems
Syllabus of subjects

List of Subjects

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125105/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125106/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Management of Technology

Associate Professor · Tatsuya Deguchi (2 units)

Target〉 About the production management of the automobile industry, it is understood variously from the point of view such as ”research and development”, ”production management”, ”purchasing” and ”quality control” ”marketing” and ”cross-cultural management”.

Outline〉 It learns about the production management. This time, ”the automobile industry” specially takes up the production management of ”Honda Motor Co.,Ltd. (following Honda)” even of that in the case, and the class to appreciate that importance with ranking of technology in management is taken.

Requirement〉 Finish ” Introduction to new business ” or ” Advanced Lecture in management Theory of new business ” .

Notice〉 Face a class when a taking lecture person surely does enough preparation every time. And moreover, be the worst, but one person one time is to do some remarks every time.

Goal〉

1. The elementary knowledge of management is learned.
2. Ranking of the technology in management and that importance are appreciated.
3. It learns how to solve the various problems which always occur in the spot of the management through the case study and the business game.

Schedule〉

1. Guidance
2. Lecture ”What in Management of Technology?”
3. Case report ”Rsearch and development of Honda”
4. Case study ”Plan an overseas factory.” ”A new car development order”
5. Lecture ” Production management and purchasing”
6. Lecture ”Quality control”
7. Case report ”The production management of Honda”,”The supply chain management of Honda”
8. Case study ”Plan an overseas factory.”
9. Case report ”The quality control of Honda”
10. Case study ”Don't make material defects flare up again.”
11. Lecture ”Marketing strategy”
12. Lecture ”Cross-cultural management”
13. Case report ”Around the products project of Honda - the two-wheeled vehicle ”
14. Case report ”The path of internationalization of Honda”
15. Case report ”The personnel management of Honda”
16. Summary and questions and answers

Evaluation Criteria〉 It is evaluated in the remark (20%) in class and the middle, end of a term report (80% in total).

Textbook〉 It doesn't specially use.The summary and so on is distributed every time.

Reference〉 Several are introduced in class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125107/

Student〉 The person who finished ”Introduction to new business” or ” Advanced Lecture in management Theory of new business “ in all the students enrolled in the doctor former term course. And, the number of taking lecture people is restricted to do intensive learning. (20-25 people will be made an upper limit.) It is selected with some means in case of a taking lecture person many.

Note〉 This class invites seven Honda alumnuni who did work in ”research and development”, ”production management”, ”purchasing”, ”quality control”, ”marketing” , ”cross-culutural management”, and so on as an instructor, and it is the class to do case report. Even if it is seen nationwide, the trial done like this is very rare, and it is a precious class. And, an applicant for taking lecture is to attend it in the guidance to hold it in advance.A schedule is indicated separately.

Presentation Method (M)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125108/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (M)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal.
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125109/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (M)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125110/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Advanced Theory of Complex System Engineering

Associate Professor · Tetsushi Ueta, *Executive Director* · Hiroshi Kawakami (2 units)

Target〉 comprehension and application of complex systems by using engineering methodlogies

Outline〉 Complex systems are defined as compound dynamical systems whose behavior and features cannot be predicted because of their nonlinearities and connecting conditions. This emergence of behavior is not possible for a single dynamcal system. therefore, connection, coupling, compounding are keywords of this theory. Emergence of rythm in biological systems, self organization, chaotic properties in high degrees of freedom, lerning and associative memory are example features of complex systems. In this lecture, based on physical systems which are ubiquitously found and treated by system engineering subjects, we study analytical methods to understand these phenomena, bifurcation theory of nonlinear and linear systems, applied extraction methods of valuable information from observed data, system design methods of compound dynamical systems.

Style〉 Lecture

Keyword〉 complex system, bifurcation, chaos, nonlinear phenomena

Fundamental Lecture〉 "Differential Equations (II)"(1.0), "Transient Analysis"(1.0), "Industrial Basic Physics"(1.0)

Relational Lecture〉 "Advanced Theory of System Analysis"(0.5, ⇒211 page), "Topics of mathematical physics"(0.5, ⇒231 page), "Advanced Electrical Control System"(0.5, ⇒207 page), "Advanced Theory of Electronic Circuits"(0.5, ⇒215 page)

Requirement〉 none

Goal〉

1. understanding of the definition and target area of complex systems
2. understanding of qualitative approach for given dynamical system
3. understanding and application of bifurcation theory

Schedule〉

1. examples of complex systems
2. relationship between bifurcation problems and complex systems
3. comptation of bifurcation parameter values
4. chaos and bifurcation phenomenon
5. chaotic itinerary
6. emergence mechanism of spatio temporal chaos and its clustering
7. phase transition and synchronization
8. spatio temporal intermittency and emergence of patterns
9. chaos neural network
10. neuronal circuits as complex systems
11. bifurcations in emergence systems
12. analysis of social systems
13. survey on complex systems
14. exercise 1
15. exercise 2
16. questions and answers

Evaluation Criteria〉 The total grade is evaluated by homework reports (70 %) and attendance of the class. (30 %)

Textbook〉 specified every class.

Reference〉 Chaotic Scenario of Complex Systems, Asakura-Shoten, 1996 (in Japanese)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125118/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Ueta (Ait502, +81-88-656-7501, tetsushi@ait.tokushima-u.ac.jp)
⇒ Kawakami (, +81-88-656-7465, hukugakk@honbu.tokushima-u.ac.jp)

Advanced Theory of Electromagnetic Compatibility

Professor · Katsuo Isaka (2 units)

Target〉 The purpose of this lectrure is to help students understand (1) electromagnetic environments quantitatively, (2) thier electrical effects on the industrial products and (3) their biological effects on humans.

Outline〉 (1) Fundamentals of electromagnetic theory, (2) Electromagnetic compatibility (EMC) of industrial products, (3) Guideline of protection of humans from environmental electromagnetic fields, and (4) Concept of EMC in 21st century.

Style〉 Lecture

Keyword〉 Electromagnetic field, Electromagnetic interference, Electromagnetic immunity

Fundamental Lecture〉 "Advanced Circuit Theory"(0.2, ⇒214 page), "Advanced Theory of Electronic Circuits"(0.2, ⇒215 page), "Advanced Biological Engineering"(0.2, ⇒213 page)

Relational Lecture〉 "Erectric Power System"(0.2, ⇒205 page)

Requirement〉 Good understanding of electromagnetics theory.

Goal〉

1. To be able to understand natural and artificial environments by the theoretical use of electromagnetic fields.
2. To be able to understand the pratice of electromagnetic compatibility design of electric and electronic equipments.
3. To be able to understand the discussions of electromagnetic fields effects on living bodies by international agencies.

Schedule〉

1. Electric field, magnetic field and Electromagnetic field (1).
2. Electric field, magnetic field and Electromagnetic field (2).
3. Electric field, magnetic field and Electromagnetic field (3).
4. Electromagnetic fields in natural environment.
5. Man-made low frequency electromagnetic fields.
6. Low frequency electromagnetic fields in residential and occupational environments.
7. Man-made High frequency electromagnetic fields.
8. Concept of electromagnetic compatibility.
9. Electromagnetic interference and immunity
10. Effects of environmental electromagnetic fields on electronic circuits.
11. Biological effects of electromagnetic fields.
12. Protection of humans from ionizing and non-ionizing electromagnetic fields.
13. Precautionary principle by World Health Organization.
14. Living environments in 21st century and EMC.
15. Review talk and discussions.
16. Examination.

Evaluation Criteria〉 Assignments count 30% and Examination 70%.

Textbook〉 None.

Reference〉 Will be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125119/

Student〉 Any students can attend the class.

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)12:00 to 13:00 Monday through Friday

Note〉 This lecture will be given in English.

Advanced Lecture of E-business

Professor · Yohsuke Kinouchi (2 units)

Target〉 To master key technologies used in e-business and the principles.

Outline〉 Key technologies for e-business are introduced.

Style〉 Lecture

Keyword〉 e-businness, internet

Requirement〉 none

Notice〉 none

Goal〉

1. To get knowledge on e-business
2. To get skills for e-business

Schedule〉

1. e-business
2. Internet and the mechanism
3. Mobile network and the mechanism
4. Network management
5. Security for e-business
6. typical e-business model
7. estabilishment of e-business
8. administration of e-business
9. accounting for e-business
10. customer management in e-business
11. complaints management in e-business
12. Examples of e-business in production areas
13. Examples of e-business in commercial areas
14. Examples of e-business in service areas
15. Example of e-business in social areas
16. Commnents on reports

Evaluation Criteria〉 Evaluated by portfolios and/or examinations

Textbook〉 Printed materials

Reference〉 References will be introduced in the classes.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125120/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kinouchi (, +81-88-656-7475, kinouchi@ee.tokushima-u.ac.jp)

Topics of mathematical physics

Professor · Shigeaki Nagamachi (2 units)

Target〉 We study the quantum computing.

Outline〉 We study the elementary theory of numbers and group theory in order to understand RSA cryptography based on the difficulty of factorization for a big number. We study the theory of Hilbert spaces and their operators to understand Shor's fast factorization algorithm for quantum computers.

Goal〉 Understanding the principle of quantum computation

Schedule〉

1. Group theory 1
2. Group theory 2
3. Number theory 1
4. Number theory 2
5. RSA cryptography
6. Shor's factirization algorithm 1
7. Hilbert space
8. Operators on Hilbert space
9. Quantum mechanics 1
10. Quantum mechanics 2
11. Quantum information
12. Quantum circuits
13. Quantum Fourier transformation
14. Shor's factorization algorithm 2
15. The complexity of Shor's factorization algorithm
16. Reserve day

Textbook〉 Mika Hirvensalo, Quantum Computing, Springer (2004)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125273/

Topics of Analysis for Mathematical Science

Associate Professor · Atsuhito Kohda (2 units)

Target〉 Mathematical theory and technique for analysis of engineering phenomena

Outline〉 Mathematical theory to analyze problems in engineering and its application, mainly theory and technique of differential equations

Style〉 Lecture

Relational Lecture〉 "Advanced applied analysis"(0.2, ⇒22 page), "Differential Equations"(0.2, ⇒19 page)

Requirement〉 If you like undergraduate-level mathematics, it will be sufficient.

Goal〉 To be familiar with mathematical theory, that helps engineering study.

Schedule〉

1. Introduction to basic modern mathematics 1
2. Introduction to basic modern mathematics 2
3. Linearity and nonlinearity
4. Representation formula and existence of solutions 1
5. Representation formula and existence of solutions 2
6. Representation formula and existence of solutions 3
7. Behavior of solutions and problems of engineering 1
8. Behavior of solutions and problems of engineering 2
9. Solutions and spaces of functions 1
10. Solutions and spaces of functions 2
11. Solutions and spaces of functions 3
12. Topics of modern analysis 1
13. Topics of modern analysis 2
14. Mathematics and computer
15. Summary

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125274/

Contact〉 Kohda (A211, +81-88-656-7546, kohda@pm.tokushima-u.ac.jp)

Methods for analysis of mathematical phenomena

Professor · Hitoshi Imai (2 units)

Target〉 To learn the to analyze the mathematical phenomena.

Outline〉 Methods used in analysis of mathematical phenomena are introduced. Especially, those in numerical analysis are focused on.

Style〉 Lecture

Keyword〉 Mathematics, Numerical, Analysis

Fundamental Lecture〉 "Numerical Analysis"(1.0)

Requirement〉 Only the premise that have studied basic mathematics.

Goal〉 The adequacy of the two-dimensional boundary value problem governed by the Poisson equation can be understood by the finite difference method, etc.

Schedule〉

1. Introduction to computer
2. Common sense in numerical computation
3. High-speed computation (Parallel computing)
4. Finite difference method I
5. Finite difference method II
6. Finite difference method III
7. Finite difference method IV
8. Finite element method I
9. Finite element method II
10. Finite element method III
11. Finite element method IV
12. Boundary element method I
13. Boundary element method II
14. Boundary element method III
15. Spectral method

Evaluation Criteria〉 Evaluation by the report.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125275/

Contact〉 Imai(A220, +81-88-656-7541, The inquiry by means of the cellular phone or E-mail is not acceptable)Office hours: Thursday 14:00-15:00

Quantum mechanics and advanced lecture in quantum physics

Associate Professor · Yoshitaka Michihiro (2 units)

Target〉 This class introduces the quantum mechanics.

Outline〉 Basics of quantum mechanics are introduced.

Style〉 Lecture

Goal〉 To understand the outline of quantum mechanics.

Schedule〉

1. Introduction
2. Variation
3. Lagrangian
4. Hamiltonian
5. The principles of quantum mechanics (1) Operator
6. The principles of quantum mechanics (2) Wavefunction
7. The principles of quantum mechanics (3) Expectation value
8. The principles of quantum mechanics (4) Schrödinger equation
9. Example (1) the square well potential
10. Example (2) the linear harmonic oscillator
11. Example (3) hydrogen atom
12. The principles of quantum mechanics (5) Heisenberg equation
13. Many-body problem
14. Field quantization
15. Phonon

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125276/

Contact〉 Yoshitaka Michihiro (A203)

Language Modeling

Professor · Kenji Kita, *Associate Professor* · Masami Shishibori (2 units)

Target〉 The course introduces some probabilistic models of natural language.

Outline〉 Due to the availability of large text corpora, probabilistic approaches to modeling natural language text have become dominant in recent years. This lecture gives an overview of probabilistic modeling of natural language, including n-gram models, hidden Markov models, probabilistic grammars, and maximum entropy models, as well as their applications to natural language processing and information retrieval.

Style〉 Lecture in combination with Portfolio

Keyword〉 natural language, probabilistic model, n-gram model, probabilistic grammar

Fundamental Lecture〉 "Automata and Formal Languages"(1.0)

Relational Lecture〉 "Natural Language Understanding"(0.5, ⇒241 page), "Machine Translation"(0.5, ⇒243 page)

Goal〉 To acquire effective techniques for modeling natural language texts using probabilistic models.

Schedule〉

1. Overview of the course
2. Modeling natural language
3. Estimation and evaluation of probabilistic models
4. N-gram model
5. Hidden Markov model
6. Maximum entropy model
7. Probabilistic grammar
8. Partitions of numbers and Young diagram
9. Symmetric group and its action on polynomials
10. Symmetric form and Young diagram
11. Bumping game
12. Sliding game
13. Product operations on Young tableaux
14. Word problem
15. Recent topics
16. Assignment

Evaluation Criteria〉 Assignment count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125277/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kita (Dr503, +81-88-656-7496, kita@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20

Note〉 Invited talk by a part-time lecturer will be given.

Integreted circuits design

Professor · Norio Akamatsu, Minoru Fukumi (2 units)

Target〉 The aim of this lecture is to explain the very large scale integrated circuits desin for understanding artificial intelligence and future trend of computer system. Therefore, the computer architecture, VLSI design, and computer programming for artificial intelligence are lectured.

Outline〉 The design method is divided into a random logic and a structured logic. In this lecture the structured logic desin using C-MOS transistor is explained. Further, a fabrication technology and a testing method are lectured. An application specfic integrated circuits which are used in many fields are explained by showing practical examples.This lecture is based on physics and mathematics and related with fundamental engineering.

Style〉 Lecture

Keyword〉 very large scale integrated circuit, struvtured logic, computer architecture, C-MOS, memory

Fundamental Lecture〉 "Integreted circuits design"(1.0, ⇒236 page)

Relational Lecture〉 "Advanced Lecture in Intelligent Science"(1.0, ⇒244 page)

Requirement〉 In order to understand this lecture contents, it may be necessary to have a image of the electrical circuits, mathematics, and physics.

Notice〉 In this lecture, the personal computer may be used for design of integrated circuits.

Goal〉 to understand the design technology of very large scale integrarted circuits

Schedule〉

1. fundamental concepts of C-MOS integrated circuits
2. C-MOS inverter and NAND logic circuits
3. C-MOS NOR logic and XOR logic circuits
4. C-MOS process technology and device production
5. theory of evaluation of integrated circuits
6. design rule and reliability of integrated circuits
7. design tecchnology of field work
8. design of system control
9. design of applicatin specific integrated circuits
10. survay of digital signal processing device
11. design of programmable devices
12. static RAM and dynamic RAM
13. logic compiler and macro cell
14. abstract of input output interface
15. utilization intellectual property
16. survay of system-on-chip integrated circuits
17. testinng and evaluation

Evaluation Criteria〉 In order to overcome the aim of this lecture, the actual system is designed and its performance is evaluated.

Textbook〉 Integrated Circuits Design

Reference〉 Introduction to VLSI design

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/133073/

Student〉 Able to be taken by only specified class(es)

Contact〉 Akamatsu (D209, +81-88-656-7493, akamatsu@is.tokushima-u.ac.jp)afternoon of friday

Autonomous Intelligent Systems

Professor · Norihiko Ono, *Associate Professor* · Yoshio Mogami (2 units)

Target〉 As effective design methods of autonomous intelligent systems, the reinforcement learning algorithms have received much attention that allow the systems to obtain appropriate decision policies by trial and error even in environments with delayed rewards. This class provides the basic concepts and theories concerning the algorithms as well as their application techniques.

Outline〉 While top-down approaches to intelligent systems design problems have exposed various limitations, bottom up approaches have been proposed and studied that allow intelligent systems to improve their own performance autonomously and incrementally during the course of interactions with the environments. This class covers those bottom-up approaches mainly focused upon the reinforcement learning algorithms.

Style〉 Lecture

Keyword〉 autonomous agents, emergent systems design, reinforcement learning, robotics, multi-agent systems

Fundamental Lecture〉 "Artificial Intelligence 2"(0.5)

Goal〉 Recently, bottom-up approaches to the intelligent systems designs problems have been proposed based on various reinforcement learning algorithms. This class aims at the understanding of the theory of the algorithms as well as their potentials and limitations through the applications to small-scale systems design problems.

Schedule〉

1. Introduction
2. Reinforcement learning: basic concepts (1)
3. Reinforcement learning: basic concepts (2)
4. Basic reinforcement learning algorithms (1)
5. Basic reinforcement learning algorithms (2)
6. Basic reinforcement learning algorithms (3)
7. Reinforcement learning considering application to real-world tasks (1)
8. Reinforcement learning considering application to real-world tasks (2)
9. Reinforcement learning based on evolution strategies
10. Reinforcement learning based on evolutionary computation
11. Reinforcement learning based on genetic programming
12. Reinforcement learning and robotics (1)
13. Reinforcement learning and robotics (2)
14. Reinforcement learning and multi-agent systems (1)
15. Reinforcement learning and multi-agent systems (2)
16. Report

Evaluation Criteria〉 Attendance (30%), report (70%)

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125279/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Ono (D106, +81-88-656-7509, ono@is.tokushima-u.ac.jp)

⇒ Mogami (C404, +81-88-656-7505, moga@is.tokushima-u.ac.jp)Tue. 17:00–18:00, Wed. 15:30–17:30 (Refer to the notice of the department in every year.)

Information and Communication Network

Assistant Professor · Masami Mohri, Hitoshi Tokushige (2 units)

Target〉 This class provides the knowledge necessary for understanding architecture and fundamental technics of information and communication network.

Outline〉 This lecture is focused on architecture of information and communication network and its fudamental technologies. Particulary, methods of multimedia data transmitting, network architecture and network security are explained in this lecture.

Style〉 Lecture

Keyword〉 Information and Communication Network, Digital data transmission, Network architecture, Network security

Requirement〉 特になし

Notice〉 特になし

Goal〉

1. Architecture of Information and communication network can be learned
2. Fundamental technics for Information and communication network can be learned

Schedule〉

1. Information and communication systems
2. Fundamental technologies of data transmission
3. Digital data transmission (1)
4. Digital data transmission (2)
5. Error control
6. Network architecture
7. Communication line
8. Network security
9. Cryptography Algorithm
10. Digital signature
11. Communication security
12. Authentication protocol
13. Mobile communication systems (1)
14. Mobile communication systems (2)
15. Broadcast systems
16. Assignment

Evaluation Criteria〉 Result is decided by attendance(20%) and Assignment (80%).

Textbook〉 Printed synopsises of lecture are distributed.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125280/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Mohri (C301, +81-88-656-7487, mmohri@is.tokushima-u.ac.jp)Monday 15:00–18:00
⇒ Tokushige (C303, +81-88-656-9447, tokusige@is.tokushima-u.ac.jp)

Applied Image Processing

Professor · Shunichiro Oe, *Associate Professor* · Kenji Terada, Tetsushi Ueta (2 units)

Target〉 This class provides the skills and the knowledge of basic and advanced image processing in the industrial field and the robot field.

Outline〉 This class introduces the techniques and applications of image processing necessary for control system and inspection system. This class explains the hardware and software about image I/O systems, high-speed image processing methods and robot vision.

Style〉 Lecture

Keyword〉 image processing, robot vision, inspection system

Fundamental Lecture〉 "Image Processing"(1.0), "Pattern Recognition"(1.0)

Goal〉 工業用画像処理システムを構築する際に必要な実用的な技術とロボットの視覚技術等についての知識の習得

Schedule〉

1. concept of industrial image processing
2. image acquisition system
3. principle of lens and light source device
4. hardware of image processing(1)
5. hardware of image processing(2)
6. three dimensional image feature extraction(1)
7. three dimensional image feature extraction(2)
8. shift and shape recognition(1)
9. shift and shape recognition(2)
10. inspection system(1)
11. inspection system(2)
12. robot vision
13. mobile robot
14. micro robot
15. trend of robotics
16. Report

Evaluation Criteria〉 Result is decided by attendance(20%) and reports(80%).

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125281/

Student〉 Able to be taken by only specified class(es)

Contact〉 Oe (C204, +81-88-656-7500, oe@is.tokushima-u.ac.jp)

Web Programming

Professor · Takao Shimomura, *Associate Professor* · Kenji Ikeda (2 units)

Target〉 This class provides the knowledge and skills necessary for efficiently developping Web applications in the Internet, and implementing the software of high quality.

Outline〉 This class introduces Web programming frameworks and Web programming techniques systematically necessary for efficiently developing Web applicatins of high quality, and then explains the development of some Web application systems as practical examples to teach the development skills such as Web design patterns.

Style〉 Lecture

Keyword〉 Java, Servlet, JSP, Web applications

Fundamental Lecture〉 "Programming Methodology 1"(1.0), "Programming Methodology 2"(1.0)

Relational Lecture〉 "System Administration"(0.5)

Requirement〉 Students are required to hava a good understanding of undergraduate-level Java programming and related subjects.

Goal〉 To understand the system configuration of Web applications that consists clients and a server, and design flexible Web application systems

Schedule〉

1. Web application server
2. Servlet
3. JavaServer Pages
4. Applet
5. Javascript
6. Database
7. Web application 1
8. Web application 2
9. Web programming framework 1
10. Web programming framework 2
11. Introduction to NisWeb system
12. Structure of NisWeb system
13. Java design patterns
14. Web design patterns 1
15. Web design patterns 2
16. Assignment

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125282/

Student〉 Able to be taken by only specified class(es)

Contact〉 Shimomura (C402, +81-88-656-7503, simomura@is.tokushima-u.ac.jp)Wed 15:00~ 18:00

Natural Language Understanding

Professor · Jun-ichi Aoe, *Assistant Professor* · Masao Fuketa (2 units)

Target〉 This lecture is focused on methods of Natural Language Understanding for human-communication and intelligent text search applications. Particulary, syntax analysis algorithms and semantic analysis technics for various kinds of applications are explained in this lecture.

Outline〉 Understanding is most important technics for the human-communication and the intelligent text search. Efficiency of the technics depend on the relationsips between knowledge dictionaries and analysis algorithms. In this lecture, case-structure with semantic informations and case-analysis algorithms is explained. Moreover, the newest Natural Language Processing systems are introduced with detailed examples. Exercises include Trie structure for the semantic dictionary, understanding for formal document, and understanding for patent documents. This subject of lecture belongs to industrial field.

Style〉 Lecture in combination with Portfolio

Keyword〉 Dialogue Understanding, Intention Understanding, Knowledge Dictionary, Morphological Analysis, Patent Document

Fundamental Lecture〉 "Language Engineering 1"(1.0), "Language Engineering II"(1.0)

Relational Lecture〉 "Machine Translation"(0.5, ⇒243 page), "Language Modeling"(0.5, ⇒235 page)

Goal〉

1. Technics of Natural Language Understanding, Dialogue Undierstanding and Intention Understanding can be learned.
2. Key search methods in Natural Language Processing can be learned.
3. Technics of Morphological Analysis and Kana-Kanji Translation can be learned.
4. How to describe technical document and patent document based on Language Understanding can be learned.

Schedule〉

1. Introduction
2. Dialogue Understanding
3. Intention Understanding, Report
4. New Information on Composition
5. Design of Composition Structure, Report
6. Knowledge Dectionary
7. Key Search Algorithm
8. Trie Structure, Report
9. Morphological Analysis
10. Kana-Kanji Translation, Report
11. Understanding of Technical Document
12. Exercise for Understanding of Technical Document, Report
13. Understanding of Technical Document
14. Understanding of Patent Ducument
15. Exercise for Understanding of Patent Document, Report
16. Report

Evaluation Criteria〉 Result is decided by attendance(20%) and reports(80%).

Textbook〉 Printed synopsises of lecture are distributed.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125283/

Student〉 Able to be taken by only specified class(es)

Contact〉 Aoe (Dr604, +81-88-656-7486, aoe@is.tokushima-u.ac.jp)

Intelligent CAI

Professor · Yoneo Yano, *Associate Professor* · Kazuhide Kanenishi, Hiroaki Ogata (2 units)

Target〉 This course aims to instruct the design methods for intelligent systems from the point of view of new Ergonomics and knowledge engineering.

Outline〉 Computers are being used in Education. In this course, we will instruct about intelligent CAI (Computer Assisted Instruction). Especially, we will talk about the difference between traditional CAI and inteligent one and the applications of ICAI, and user interfaces and teaching strategies based on theories and practices.

Style〉 Lecture

Keyword〉 Educational Technology, Learning Science

Fundamental Lecture〉 "Web Programming"(1.0, ⇒240 page), "Information and Communication Network"(1.0, ⇒238 page), "Autonomous Intelligent Systems"(1.0, ⇒237 page)

Relational Lecture〉 "Venture Business (M)"(0.5, ⇒227 page), "Natural Language Understanding"(0.5, ⇒241 page), "Presentation Method (M)"(0.5, ⇒225 page)

Goal〉 You will acquire how to design and implement the system of Intelligent CAI.

Schedule〉

1. Overview of Intelligent CAI
2. History and theories of CAI
3. Intelligent CAI
4. Learner model
5. Intelligent Tutoring System
6. Interactive Learning Environment
7. CSCL(1)
8. CSCL(2)
9. WBL(Web Based Learning)
10. e-Learning(1)
11. e-Learning(2)
12. e-Learning(3)
13. Ubiquitous and Mobile Learning Environment(1)
14. Ubiquitous and Mobile Learning Environment(2)
15. Summery of Educational Technologies
16. examination

Evaluation Criteria〉 We will grade based on reports (30 poitns) and examinations (70 points). But this is subject to change.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125284/

Contact〉

⇒ Yano (C511, +81-88-656-7495, yano@is.tokushima-u.ac.jp)
⇒ Kanenishi (, +81-88-656-7285, marukin@cue.tokushima-u.ac.jp)
⇒ Ogata (C507, +81-88-656-7498, ogata@is.tokushima-u.ac.jp)

Machine Translation

Professor · Fuji Ren, *Associate Professor* · Shingo Kuroiwa (2 units)

Target〉 As a research and development field, machine translation (MT) is among the oldest among the various subdisciplines and applications of computer science to the study of natural language. This lecture aims to understand the basic MT technologies and to learn the latest MT theory and new approaches to develope MT system.

Outline〉 This lecture teaches the theory of machine translation (MT) and the technologies of MT systems. Main items in the lecture are syntax analysis, semantic analysis, knowledge processing, world knowledge model, natural-language-processing function, super-function, multilingual processing, etc.

Style〉 Lecture

Keyword〉 Machine Translation, Syntax Analysis, Semantic Analysis, Super Function

Fundamental Lecture〉 "Language Engineering 1"(1.0)

Relational Lecture〉 "Natural Language Understanding"(0.5, ⇒241 page)

Goal〉

1. To understand the basic theory of machine translation (MT).
2. To Master the technique of developing a MT system.
3. To grasp the newest trend of machine translation research.

Schedule〉

1. Introduction
2. Machine translation system
3. Morphological analysis I
4. Morphological analysis II
5. Syntax analysis I
6. Syntax analysis II
7. Semantic analysis I
8. Semantic analysis II
9. Semantic analysis III
10. Context analysis
11. Dictionary
12. Super-Function based MT I
13. Super-Function based MT II
14. Super-Function based MT III
15. Ontology and machine translation
16. Examination

Evaluation Criteria〉 Attendance (30%), report (30%), examination (40%)

Textbook〉 no special book

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125285/

Student〉 Able to be taken by only specified class(es)

Contact〉 Ren (C204, +81-88-656-9684, ren@is.tokushima-u.ac.jp)16:00-15:00 Tuesday, 16:00-17:00 Thursday

Advanced Lecture in Intelligent Science

Professor · Minoru Fukumi (2 units)

Target〉 This lecture aims to understand the latest topics in a field of Intelligent systems, and to obtain advanced knowledge and technologies.

Outline〉 This lecture teaches the advanced topics in intelligent systems. The main items in this lecture are softcomputing and human information processing, including face information processing and its computer practice.

Style〉 Lecture and excercise

Keyword〉 Softcomputing, Hyman Information rocessing

Goal〉

1. To understand the latest topics on Intelligent systems.
2. To learn the trend of a domestic and foreign research on Intelligent systems.

Schedule〉

1. Topics in Advanced Intelligent Systems 1
2. Topics in Advanced Intelligent Systems 2
3. Exercise in Advanced Intelligent Systems 1
4. Exercise in Advanced Intelligent Systems 2, Report
5. Topics in Advanced Softcomputing techniques 1
6. Topics in Advanced Softcomputing techniques 2
7. Topics in Advanced Softcomputing techniques 3
8. Exercise in Softcomputing 1
9. Exercise in Softcomputing 2, Report
10. Topics in Advanced Human Information Processing 1
11. Topics in Advanced Human Information Processing 2
12. Topics in Advanced Human Information Processing 3
13. Exercise in Human Information Processing 1
14. Exercise in Human Information Processing 2
15. Exercise in Human Information Processing 3, Report
16. Occasional

Evaluation Criteria〉 Attendance (30%), practice(20%), report (50%)

Textbook〉 no special book

Reference〉 講義 · 演習中に指定する.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125289/

Student〉 Able to be taken by only specified class(es)

Contact〉 Fukumi (D210, +81-88-656-7510, fukumi@is.tokushima-u.ac.jp)

Note〉 ゲストスピーカーを招聘して講義 · 演習を行う場合がある.

Seminor and Exercise in Information Science

Associate Professor · Shingo Kuroiwa, Masami Shishibori, *Assistant Professor* · Masahiko Sano, Masami Mohri, Hitoshi Tokushige, *Associate Professor* · Kenji Terada
Associate Professor · Tetsushi Ueta, Kenji Ikeda, Yoshio Mogami, *Assistant Professor* · Masao Fuketa, *Associate Professor* · Hiroaki Ogata (6 units)

Target〉 Improve presentation skill, writing technique, discussion ability, and basic knowledge about the information technology.

Outline〉 (1) Students groups present the research theses of their research groups and basic of information related to them, (2)Each student introduces information technology and others in English, and (3) Each student presents his/her master's thesis.

Style〉 Practice, Excercise

Goal〉

1. Development of knowlege of information technology.
2. Improvement of writing skill.
3. Improvement of presentation skill.

Schedule〉

1. Orientation
2. Introduction to the research topics of each reaserach group (1)
3. Introduction to the research topics of each reaserach group (2)
4. Introduction to the research topics of each reaserach group (3)
5. Introduction to the research topics of each reaserach group (4)
6. Introduction to the research topics of each reaserach group (5)
7. Introduction to the research topics of each reaserach group (6)
8. Introduction to the research topics of each reaserach group (7)
9. Introduction to the research topics of each reaserach group (8)
10. Introduction to the research topics of each reaserach group (9)
11. Introduction to the research topics of each reaserach group (10)
12. Introduction to the research topics of each reaserach group (11)
13. Introduction to the research topics of each reaserach group (12)
14. Introduction to the research topics of each reaserach group (13)
15. Introduction to the research topics of each reaserach group (14)
16. Information technology on the reserach topics of each reaserch group (1)
17. Information technology on the reserach topics of each reaserch group (2)
18. Information technology on the reserach topics of each reaserch group (3)
19. Information technology on the reserach topics of each reaserch group (4)
20. Information technology on the reserach topics of each reaserch group (5)
21. Information technology on the reserach topics of each reaserch group (6)
22. Information technology on the reserach topics of each reaserch group (7)
23. Information technology on the reserach topics of each reaserch group (8)
24. Information technology on the reserach topics of each reaserch group (9)
25. Information technology on the reserach topics of each reaserch group (10)
26. Information technology on the reserach topics of each reaserch group (11)
27. Information technology on the reserach topics of each reaserch group (12)
28. Information technology on the reserach topics of each reaserch group (13)
29. Information technology on the reserach topics of each reaserch group (14)
30. Poster presentation of Master's thesis
31. Orientation of English presentation
32. English presentation (1)
33. English presentation (2)
34. English presentation (3)
35. English presentation (4)
36. English presentation (5)
37. English presentation (6)
38. English presentation (7)
39. English presentation (8)
40. English presentation (9)
41. English presentation (10)
42. English presentation (11)
43. English presentation (12)
44. English presentation (13)
45. English presentation (14)
46. Orientation of oral presentation of master's thesis
47. Presentation of master's thesis (1)
48. Presentation of master's thesis (2)
49. Presentation of master's thesis (3)
50. Presentation of master's thesis (4)
51. Presentation of master's thesis (5)
52. Presentation of master's thesis (6)
53. Presentation of master's thesis (7)
54. Presentation of master's thesis (8)
55. Presentation of master's thesis (9)
56. Presentation of master's thesis (10)
57. Presentation of master's thesis (11)
58. Presentation of master's thesis (12)
59. Presentation of master's thesis (13)
60. Presentation of master's thesis (14)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125290/

Student〉 Able to be taken by only specified class(es)

Laboratory in Information Science

Teacher of course (10 units)

Target〉 To conduct research leading to the awarding of masters degrees.

Outline〉 To conduct research in the Natural Language Understanding, Document Processing, Multimedia Information Retrieval, Image Processing, Movie Image Processing, Voice Recognition, Autonomous Agents Design, Internet Security, Intelligent Software, etc (seminars, portfolios etc).

Style〉 Lecture in combination with Portfolio

Keyword〉 Information Science, Software Engineering

Notice〉 Course plan differs depending on the laboratory you choose.

Goal〉 To present the results of your research related conferences, departmental research meetings, etc.

Schedule〉

1. After the student selects the subjects, research can be carried out at the laboratory. However, the course contents are as shown below.
2. 中韓機械翻訳におけるスーパー関数の構築について
3. 音声による姓名漢字入力インタフェースに関する研究
4. WWW 画像検索システムにおける有害画像フィルタリング手法に関する研究
5. カラー画像からの標識の自動認識
6. 進化計算による多峰性関数最適化に関する研究
7. blog を対象とした探索収集に関する研究
8. Web カメラを用いた遠隔会議支援システムの開発
9. カラーヒストグラムの情報を用いたカラー画像の局所的な露出補正
10. デザインパターンに基づくリファクタリング方式の研究
11. Web ページの焦点分析技術に関する研究
12. 感情を表現する音声合成の韻律制御に関する研究
13. 時間変化を考慮した語彙と表現の傾向分析に関する研究
14. 競合的情報共有アプローチによる Web 教材オーサリングシステム
15. 感性共有に基づく協調的音楽鑑賞支援に関する研究
16. ユビキタスゲーム型英語学習環境における問題文自動生成に関する研究

Textbook〉 None

Reference〉 Using papers for each research field.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125291/

Student〉 Able to be taken by only specified class(es)

Contact〉 Committee Member of School Affair

Systems Innovation Engineering — Information Science and Intelligent Systems
Web page and CMS related subject

- *Integrated Subjects*
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Management of Technology ..... WEB page, CMS
  - Presentation Method (M) ..... WEB page, CMS
  - Internship (M) ..... WEB page, CMS
  - Venture Business (M) ..... WEB page, CMS
- *Common Subjects*
  - Advanced Theory of Complex System Engineering ..... WEB page, CMS
  - Advanced Theory of Electromagnetic Compatibility ..... WEB page, CMS
  - Advanced Lecture of E-business ..... WEB page, CMS
- *Basic Departmental Subjects*
  - Topics of mathematical physics ..... WEB page, CMS
  - Topics of Analysis for Mathematical Science ..... WEB page, CMS
  - Methods for analysis of mathematical phenomena ..... WEB page, CMS
  - Quantum mechanics and advanced lecture in quantum physics ..... WEB page, CMS
- *Applied Departmental Subjects*
  - Language Modeling ..... WEB page, CMS
  - Integreted circuits design ..... WEB page, CMS
  - Autonomous Intelligent Systems ..... WEB page, CMS
  - Information and Communication Network ..... WEB page, CMS
  - Applied Image Processing ..... WEB page, CMS
  - Web Programming ..... WEB page, CMS
  - Natural Language Understanding ..... WEB page, CMS
  - Intelligent CAI ..... WEB page, CMS
  - Machine Translation ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Lecture in Intelligent Science ..... WEB page, CMS
  - Seminor and Exercise in Information Science ..... WEB page, CMS
  - Laboratory in Information Science ..... WEB page, CMS

Systems Innovation Engineering — Optical Systems Engineering
Syllabus of subjects

List of Subjects

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125105/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125106/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Management of Technology

Associate Professor · Tatsuya Deguchi (2 units)

Target〉 About the production management of the automobile industry, it is understood variously from the point of view such as ”research and development”, ”production management”, ”purchasing” and ”quality control” ”marketing” and ”cross-cultural management”.

Outline〉 It learns about the production management. This time, ”the automobile industry” specially takes up the production management of ”Honda Motor Co.,Ltd. (following Honda)” even of that in the case, and the class to appreciate that importance with ranking of technology in management is taken.

Requirement〉 Finish ” Introduction to new business ” or ” Advanced Lecture in management Theory of new business ” .

Notice〉 Face a class when a taking lecture person surely does enough preparation every time. And moreover, be the worst, but one person one time is to do some remarks every time.

Goal〉

1. The elementary knowledge of management is learned.
2. Ranking of the technology in management and that importance are appreciated.
3. It learns how to solve the various problems which always occur in the spot of the management through the case study and the business game.

Schedule〉

1. Guidance
2. Lecture ”What in Management of Technology?”
3. Case report ”Rsearch and development of Honda”
4. Case study ”Plan an overseas factory.” ”A new car development order”
5. Lecture ” Production management and purchasing”
6. Lecture ”Quality control”
7. Case report ”The production management of Honda”,”The supply chain management of Honda”
8. Case study ”Plan an overseas factory.”
9. Case report ”The quality control of Honda”
10. Case study ”Don't make material defects flare up again.”
11. Lecture ”Marketing strategy”
12. Lecture ”Cross-cultural management”
13. Case report ”Around the products project of Honda - the two-wheeled vehicle ”
14. Case report ”The path of internationalization of Honda”
15. Case report ”The personnel management of Honda”
16. Summary and questions and answers

Evaluation Criteria〉 It is evaluated in the remark (20%) in class and the middle, end of a term report (80% in total).

Textbook〉 It doesn't specially use.The summary and so on is distributed every time.

Reference〉 Several are introduced in class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125107/

Student〉 The person who finished ”Introduction to new business” or ” Advanced Lecture in management Theory of new business “ in all the students enrolled in the doctor former term course. And, the number of taking lecture people is restricted to do intensive learning. (20-25 people will be made an upper limit.) It is selected with some means in case of a taking lecture person many.

Note〉 This class invites seven Honda alumnuni who did work in ”research and development”, ”production management”, ”purchasing”, ”quality control”, ”marketing” , ”cross-culutural management”, and so on as an instructor, and it is the class to do case report. Even if it is seen nationwide, the trial done like this is very rare, and it is a precious class. And, an applicant for taking lecture is to attend it in the guidance to hold it in advance.A schedule is indicated separately.

Presentation Method (M)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125108/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (M)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal.
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125109/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (M)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125110/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Advanced Theory of Complex System Engineering

Associate Professor · Tetsushi Ueta, *Executive Director* · Hiroshi Kawakami (2 units)

Target〉 comprehension and application of complex systems by using engineering methodlogies

Outline〉 Complex systems are defined as compound dynamical systems whose behavior and features cannot be predicted because of their nonlinearities and connecting conditions. This emergence of behavior is not possible for a single dynamcal system. therefore, connection, coupling, compounding are keywords of this theory. Emergence of rythm in biological systems, self organization, chaotic properties in high degrees of freedom, lerning and associative memory are example features of complex systems. In this lecture, based on physical systems which are ubiquitously found and treated by system engineering subjects, we study analytical methods to understand these phenomena, bifurcation theory of nonlinear and linear systems, applied extraction methods of valuable information from observed data, system design methods of compound dynamical systems.

Style〉 Lecture

Keyword〉 complex system, bifurcation, chaos, nonlinear phenomena

Fundamental Lecture〉 "Differential Equations (II)"(1.0), "Transient Analysis"(1.0), "Industrial Basic Physics"(1.0)

Relational Lecture〉 "Advanced Theory of System Analysis"(0.5, ⇒211 page), "Topics of mathematical physics"(0.5, ⇒231 page), "Advanced Electrical Control System"(0.5, ⇒207 page), "Advanced Theory of Electronic Circuits"(0.5, ⇒215 page)

Requirement〉 none

Goal〉

1. understanding of the definition and target area of complex systems
2. understanding of qualitative approach for given dynamical system
3. understanding and application of bifurcation theory

Schedule〉

1. examples of complex systems
2. relationship between bifurcation problems and complex systems
3. comptation of bifurcation parameter values
4. chaos and bifurcation phenomenon
5. chaotic itinerary
6. emergence mechanism of spatio temporal chaos and its clustering
7. phase transition and synchronization
8. spatio temporal intermittency and emergence of patterns
9. chaos neural network
10. neuronal circuits as complex systems
11. bifurcations in emergence systems
12. analysis of social systems
13. survey on complex systems
14. exercise 1
15. exercise 2
16. questions and answers

Evaluation Criteria〉 The total grade is evaluated by homework reports (70 %) and attendance of the class. (30 %)

Textbook〉 specified every class.

Reference〉 Chaotic Scenario of Complex Systems, Asakura-Shoten, 1996 (in Japanese)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125118/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Ueta (Ait502, +81-88-656-7501, tetsushi@ait.tokushima-u.ac.jp)
⇒ Kawakami (, +81-88-656-7465, hukugakk@honbu.tokushima-u.ac.jp)

Advanced Theory of Electromagnetic Compatibility

Professor · Katsuo Isaka (2 units)

Target〉 The purpose of this lectrure is to help students understand (1) electromagnetic environments quantitatively, (2) thier electrical effects on the industrial products and (3) their biological effects on humans.

Outline〉 (1) Fundamentals of electromagnetic theory, (2) Electromagnetic compatibility (EMC) of industrial products, (3) Guideline of protection of humans from environmental electromagnetic fields, and (4) Concept of EMC in 21st century.

Style〉 Lecture

Keyword〉 Electromagnetic field, Electromagnetic interference, Electromagnetic immunity

Fundamental Lecture〉 "Advanced Circuit Theory"(0.2, ⇒214 page), "Advanced Theory of Electronic Circuits"(0.2, ⇒215 page), "Advanced Biological Engineering"(0.2, ⇒213 page)

Relational Lecture〉 "Erectric Power System"(0.2, ⇒205 page)

Requirement〉 Good understanding of electromagnetics theory.

Goal〉

1. To be able to understand natural and artificial environments by the theoretical use of electromagnetic fields.
2. To be able to understand the pratice of electromagnetic compatibility design of electric and electronic equipments.
3. To be able to understand the discussions of electromagnetic fields effects on living bodies by international agencies.

Schedule〉

1. Electric field, magnetic field and Electromagnetic field (1).
2. Electric field, magnetic field and Electromagnetic field (2).
3. Electric field, magnetic field and Electromagnetic field (3).
4. Electromagnetic fields in natural environment.
5. Man-made low frequency electromagnetic fields.
6. Low frequency electromagnetic fields in residential and occupational environments.
7. Man-made High frequency electromagnetic fields.
8. Concept of electromagnetic compatibility.
9. Electromagnetic interference and immunity
10. Effects of environmental electromagnetic fields on electronic circuits.
11. Biological effects of electromagnetic fields.
12. Protection of humans from ionizing and non-ionizing electromagnetic fields.
13. Precautionary principle by World Health Organization.
14. Living environments in 21st century and EMC.
15. Review talk and discussions.
16. Examination.

Evaluation Criteria〉 Assignments count 30% and Examination 70%.

Textbook〉 None.

Reference〉 Will be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125119/

Student〉 Any students can attend the class.

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)12:00 to 13:00 Monday through Friday

Note〉 This lecture will be given in English.

Advanced Lecture of E-business

Professor · Yohsuke Kinouchi (2 units)

Target〉 To master key technologies used in e-business and the principles.

Outline〉 Key technologies for e-business are introduced.

Style〉 Lecture

Keyword〉 e-businness, internet

Requirement〉 none

Notice〉 none

Goal〉

1. To get knowledge on e-business
2. To get skills for e-business

Schedule〉

1. e-business
2. Internet and the mechanism
3. Mobile network and the mechanism
4. Network management
5. Security for e-business
6. typical e-business model
7. estabilishment of e-business
8. administration of e-business
9. accounting for e-business
10. customer management in e-business
11. complaints management in e-business
12. Examples of e-business in production areas
13. Examples of e-business in commercial areas
14. Examples of e-business in service areas
15. Example of e-business in social areas
16. Commnents on reports

Evaluation Criteria〉 Evaluated by portfolios and/or examinations

Textbook〉 Printed materials

Reference〉 References will be introduced in the classes.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125120/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kinouchi (, +81-88-656-7475, kinouchi@ee.tokushima-u.ac.jp)

Superconductivity and superconducting materials

Professor · Yutaka Kishimoto (2 units)

Target〉 To understand basics and recent developments in superconductivity.

Outline〉 This class reviews quantum mechanics and introduces superconductivity and recent superconducting materials.

Style〉 Lecture

Keyword〉 superconductivity, Cooper pair, superconducting energy gap, density of states, anisotropic superconductivity

Goal〉 To understand the outline of superconductivity.

Schedule〉

1. Introduction to superconductivity
2. Review of quantum mechanics (1), Schrödinger equation and wave function
3. Review of quantum mechanics (2), operators and expected values
4. Review of quantum mechanics (3), perturbation theory
5. Free electron model of metals
6. Phenomenological theory of superconductivity
7. To understand Meissner effect on the basis of quantum mechanics
8. Formation of Cooper pair
9. Formation of superconducting energy gap
10. Density of states, and energy gap at finite temperatures
11. Introduction to Nuclear Magnetic Resonance method
12. Frontier of superconductivity (1), strong coupling superconductor
13. Frontier of superconductivity (2), heavy Fermion superconductor
14. Frontier of superconductivity (3), copper oxide high Tc superconductor
15. Summary

Evaluation Criteria〉 Reports on several subjects in the class.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125293/

Contact〉 Yutaka Kishimoto (A202)

Topics of mathematical physics

Professor · Shigeaki Nagamachi (2 units)

Target〉 We study the quantum computing.

Outline〉 We study the elementary theory of numbers and group theory in order to understand RSA cryptography based on the difficulty of factorization for a big number. We study the theory of Hilbert spaces and their operators to understand Shor's fast factorization algorithm for quantum computers.

Goal〉 Understanding the principle of quantum computation

Schedule〉

1. Group theory 1
2. Group theory 2
3. Number theory 1
4. Number theory 2
5. RSA cryptography
6. Shor's factirization algorithm 1
7. Hilbert space
8. Operators on Hilbert space
9. Quantum mechanics 1
10. Quantum mechanics 2
11. Quantum information
12. Quantum circuits
13. Quantum Fourier transformation
14. Shor's factorization algorithm 2
15. The complexity of Shor's factorization algorithm
16. Reserve day

Textbook〉 Mika Hirvensalo, Quantum Computing, Springer (2004)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125294/

Methods for analysis of mathematical phenomena

Professor · Hitoshi Imai (2 units)

Target〉 To learn the to analyze the mathematical phenomena.

Outline〉 Methods used in analysis of mathematical phenomena are introduced. Especially, those in numerical analysis are focused on.

Style〉 Lecture

Keyword〉 Mathematics, Numerical, Analysis

Fundamental Lecture〉 "Numerical Analysis"(1.0)

Relational Lecture〉 "Advanced Computational Science"(0.5, ⇒261 page)

Requirement〉 Only the premise that have studied basic mathematics.

Goal〉 The adequacy of the two-dimensional boundary value problem governed by the Poisson equation can be understood by the finite difference method, etc.

Schedule〉

1. Introduction to computer
2. Common sense in numerical computation
3. High-speed computation (Parallel computing)
4. Finite difference method I
5. Finite difference method II
6. Finite difference method III
7. Finite difference method IV
8. Finite element method I
9. Finite element method II
10. Finite element method III
11. Finite element method IV
12. Boundary element method I
13. Boundary element method II
14. Boundary element method III
15. Spectral method

Evaluation Criteria〉 Evaluation by the report.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125295/

Contact〉 Imai(A220, +81-88-656-7541, The inquiry by means of the cellular phone or E-mail is not acceptable)Office hours: Thursday 14:00-15:00

Advanced Computational Science

Professor · Toshiki Takeuchi (2 units)

Target〉 This class provides the basic technology for numerical calculation for the differential equation.

Outline〉 The numerical calculation methods for the differential equation are introduced.

Style〉 Lecture

Keyword〉 Numerical analysis, Numerical computation, Differential equation

Fundamental Lecture〉 "Numerical Analysis"(1.0), "Basic Mathematics"(1.0), "Basic Mathematics"(1.0)

Relational Lecture〉 "Methods for analysis of mathematical phenomena"(1.0, ⇒18 page), "Numerical Analysis"(1.0)

Requirement〉 Students have to understand basic mathematics of undergraduate-level.

Goal〉 To understand principle of numerical calculation methods.

Schedule〉

1. Introduction of numerical simulation
2. Mathematical model
3. Least squares method
4. Lagrange interpolation
5. Spline interpolation
6. Finite difference method
7. Arbitrary precision formula
8. Application to the 1-dimension differential equation
9. Application to the 2-dimension differential equation
10. Gauss-Seidel method
11. Successive Over-Relaxation method
12. Explicit method
13. Implicit method
14. Crank-Nicolson method
15. Numerical instabilities

Evaluation Criteria〉 Assignments count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125296/

Student〉 Able to be taken by only specified class(es)

Contact〉 Takeuchi (A206, +81-88-656-7544, takeuchi@pm.tokushima-u.ac.jp)

Optical propertics of materials

Professor · Masuo Fukui, *Associate Professor* · Masanobu Haraguchi (2 units)

Target〉 To understand the princeple of optical response of atoms, melecules and crystals. To develop ability to apply such optical phenomena to applications.

Outline〉 With quantum mechanics, we lecture optical process of materials. This course will cover the following topics: optical propaties of materials for enegineering, classical electromagnetic theory and optical property, optical transitions and optical process of atoms, molecules and semiconductors.

Style〉 Lecture

Keyword〉 Quantum mechanics, condensed matter, optical process, semiconductor

Relational Lecture〉 "Advanced Optical and Optoelectronic Devices"(0.5, ⇒263 page), "Lecture in Optical Materials and Devices, Part 1"(0.5, ⇒272 page)

Requirement〉 Students should have fundamental knowledges of quamtum mechanics.

Goal〉

1. Students can explain the optical processes of atoms and molecules.
2. Students can explain the optical processes in semiconductors.

Schedule〉

1. Introduction
2. Optical response described by classical electro-magnetic theory
3. Schroedinger equation and wave fuction
4. Hydrogen atom model
5. spin angular momentum
6. Quantum mechanics of light
7. Transition induced by interaction between electron state and light
8. Light absorption and emittion
9. Electron transition in atoms and molecules
10. Optical spectra of atoms and molecules
11. Optical spectra of organic molecules
12. Energy bands in condensed matters
13. Optical processes in semiconductors
14. Optical spectra of impurity atoms in a crystall
15. Optical process of P-N junction
16. Final Examination

Evaluation Criteria〉 Activity: 20%, Reports: 40% and Final Exam.:40%

Textbook〉 中澤，鎌田著，光物性 · デバイス工学の基礎，培風館 1999

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125297/

Contact〉

⇒ Haraguchi (Opt.209, +81-88-656-9411, haraguti@opt.tokushima-u.ac.jp)16:05-18:00

⇒ Fukui (Opt.208, +81-88-656-9410, fukui@opt.tokushima-u.ac.jp)

Advanced Optical and Optoelectronic Devices

Professor · Masuo Fukui, *Associate Professor* · Masanobu Haraguchi (2 units)

Target〉 To understand the principle of the current optoelectronic devices, e.g., Light Emitting Diodes, Laser Diodes and so on. To develop ability to solve various problems in device application.

Outline〉 This course will cover topics on current optical and optoelectronic devices. Topics treated include Light Emiiitng Diode, Laser Diode, Optical Modulator, Nonlinear Optical Devices and Lique Qrystal Devices.

Style〉 Lecture

Keyword〉 optoelectronic device, optical device, Light Emitteing Diode, Laser Diode, Optical modulator

Relational Lecture〉 "Optical propertics of materials"(0.5, ⇒262 page), "Lecture in Optical Materials and Devices, Part 1"(0.5, ⇒272 page)

Requirement〉 Students should have fundamental knowledges about semiconductor physics and devices for undergraduate students.

Goal〉

1. Students can explain the principle and structures for light emitting devices and photodetectors.
2. Students can explain the principle and structures for liquid crystal devices.
3. Students can explain the principle and applications for electrooptic and magnetooptic effects.

Schedule〉

1. Introduction
2. Interaction between Light and dielectric materials
3. Interaction between Light and magnetic materials
4. Luminescence
5. Phospers
6. Stimulated Emittion and Laser
7. Photoconductor Cells
8. Photocopy and Image orthicon
9. Light Emitting Devices
10. Photodetectors
11. Solor cell and amorphus-semiconductor optoelectronic devices
12. Electrooptic devices
13. Nonlinear optical devices
14. Magnetooptic devices
15. Liquied Crystal Devices
16. Final Examination

Evaluation Criteria〉 Activity: 20%, Reports: 40% and Final Exam.:40%

Textbook〉 中澤，鎌田著，光物性 · デバイス工学の基礎，培風館 1999

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125298/

Contact〉

⇒ Haraguchi (Opt.209, +81-88-656-9411, haraguti@opt.tokushima-u.ac.jp)16:05-18:00
⇒ Fukui (Opt.208, +81-88-656-9410, fukui@opt.tokushima-u.ac.jp)

Advanced Lecture in Statistical Mechanics and Thermidynamics

Assistant Professor · Atsushi Mori (2 units)

Target〉 Learn to apply the statistical mechanisc and thermodynamics.

Outline〉 Concerning the mechanisms and phenomena in metericals processiong, lectures are given in method for analyzing the results on the basis of the statistical mechanics and thermodynamics and computer simulation on the atimic scale.

Style〉 Lecture

Goal〉

1. points of view in statistical mechnics and thermodynamics.
2. applying statistical mechnics and thermodynamics to the practical problem.

Schedule〉

1. item 1 (to be announced on the bulletin borad and trough web page)
2. item 2 (to be announced on the bulletin borad and trough web page)
3. item 3 (to be announced on the bulletin borad and trough web page)
4. item 4 (to be announced on the bulletin borad and trough web page)
5. item 5 (to be announced on the bulletin borad and trough web page)
6. item 6 (to be announced on the bulletin borad and trough web page)
7. item 7 (to be announced on the bulletin borad and trough web page)
8. examination
9. item 8 (to be announced on the bulletin borad and trough web page)
10. item 9 (to be announced on the bulletin borad and trough web page)
11. item 10 (to be announced on the bulletin borad and trough web page)
12. item 11 (to be announced on the bulletin borad and trough web page)
13. item 12 (to be announced on the bulletin borad and trough web page)
14. item 13 (to be announced on the bulletin borad and trough web page)
15. item 14 (to be announced on the bulletin borad and trough web page)
16. examination

Evaluation Criteria〉 to be announced

Textbook〉 to be announced

Reference〉 to be announced

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125299/

Advanced Lecture in Crystal Growth

Professor · Tetsuo Inoue (2 units)

Target〉 The function of optical device is strongly dependent on the quality of crystals. It is important to understand the growth mechanism in order to grow high quality crystals. The purposes of this lecture are to teach the various techniques for crystal growing and relation between the crystal quality and growth condition in connection with the growth mechanism.

Outline〉 各種環境相 (融液，溶液，気相) から結晶が成長する機構について述べ，主たる光学結晶がどのようにして作成されるかを講義する．また光学結晶には高品質が要求されるのでそのための育成技術についてさらにエピタキシャル法による高品質単結晶膜の作成について講述する．以上のように，この授業は工業に関する科目である．

Keyword〉 optical crystal, crystal growing techniqe, crystal perfection, epitaxial growth, characterization of crystals

Fundamental Lecture〉 "Management of Technology"(1.0, ⇒251 page)

Relational Lecture〉 "Advanced Lecture in Statistical Mechanics and Thermidynamics"(0.5, ⇒264 page), "Lecture in Optical Materials and Devices, Part 2"(0.5, ⇒273 page), "Advanced Optical and Optoelectronic Devices"(0.5, ⇒263 page)

Goal〉

1. to understand the mechanism of crystal growth
2. to understand various techniqes for crystal growth
3. to understand the relationship between the growth condition and crystal perfection

Schedule〉

1. Epitaxial growth (1) (vacuum epitaxial)
2. Epitaxial growth (2) (chemical vapor epitaxial)
3. Epitaxial growth (3) (liquid phase epitaxial)
4. Growth of optical crystals(- compounds)
5. Growth of Si crystal (1)
6. Growth of Si crystal (2)
7. Growth of oxide crystals (1)
8. Growth of oxide crystals (2)
9. Mid-term examination
10. Growth of halide crystals
11. Defects of crystals (1)
12. Defects of crystals (2)
13. Defect generation in crystal growth
14. Characterization of crystals (1)
15. Characterization of crystals (2)
16. Term end examination

Evaluation Criteria〉 Midterm examination (40%), Term end examination (40%), Attitude(20%)

Textbook〉 Teaching materials

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125300/

Student〉 Able to be taken by student of other department

Contact〉 Inoue (Opt.310, +81-88-656-9416, inoue@opt.tokushima-u.ac.jp)at any time

Macromolecular Design

Professor · Hitoshi Tanaka (2 units)

Target〉 This class introduces the generation and functionality of natural and synthetic polymers, in molecular scale, with a view to designing a functional polymer precisely.

Outline〉 Chemical macromolecular (polymer) design at an advanced level will be covered in this cource. Emphasis is on the analysis, in atomic scale, of the factors which fulfill the unique polymerizations and the speciality of polymers on the basis of the recognition of polymerization-polymer microstructure-polymer functionality relationships. Application of the analytical information to macromolecular design and recent topics in the design will also be provided in this cource.

Keyword〉 macromolecular design, polymer chemistry, functional polymer

Relational Lecture〉 "Lecture in Optical Materials and Devices, Part 3"(0.5, ⇒274 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level polymer chemistry

Goal〉

1. To understand the control of polymerization and polymer structure
2. To understand the characterization and functionality of polymer

Schedule〉

1. Introduction to macromolecular design
2. Generation and functionality of natural polymers (1)
3. Generation and functionality of natural polymers (2)
4. Generation and functionality of natural polymers (3)
5. Preparation and functionality of synthetic polymers (1): optical polymers
6. Preparation and functionality of synthetic polymers (2): optical polymers
7. Preparation and functionality of synthetic polymers (3): photo and biodegradable polymers
8. Preparation and functionality of synthetic polymers (4): photo and biodegradable polymers
9. Preparation and functionality of synthetic polymers (5): magnetic polymers
10. Preparation and functionality of synthetic polymers (6): magnetic polymers
11. Nanomaterials (1)
12. Nanomaterials (2)
13. Topics in macromolecular design (1)
14. Topics in macromolecular design (2)
15. Topics in macromolecular design (3)

Evaluation Criteria〉 Evaluation by a term paper.

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125301/

Contact〉 H. Tanaka (Opti. Build. Room 211, Phone & Fax: 088-656-9420, E-mail: tanaka@opt.tokushima-u.ac.jp)

Advanced Materials Chemistry

Assistant Professor · Yoshihiko Tezuka (2 units)

Target〉 This course intends to develop the knowledge of materials in physics, chemistry, crystallography, polymer, and semiconductors, which has been acquired in undergraduate, through the rearrangement of these knowledge in terms of the electronic states, constituting atoms and molecules, and interactions between them. The objective of the course is to develop ability to understand materials from the viewpoints of various fields.

Outline〉 Structures, properties, functions and synthesis of various materials will be explained in term of chemistry to understand materials chemistry which constitutes one of the bases of materials science. Fullerenes and their derivatives will be taken up as recent topics to explain the relationship between molecular structures and physical properties.

Goal〉

1. to enable a student to develop applications of materials by the estimation of their properties from the atoms and molecules constituting them.
2. to enable a student to develop applications of materials by the estimation of their electric and electronic properties from the electronic states.

Schedule〉

1. Introduction to materials and chemistry
2. Classification of materials according to their crystalline states and molecular aggregation states
3. Crystalline materials
4. Amorphous materials (glass, silicone, metals)
5. Molecular aggregate (micelle, liquid crystalline, gels)
6. Classification of materials according to their electronic states
7. Experimental methods for the evaluation of electric properties of materials
8. Dielectric materials (1): ceramics
9. Dielectric materials (2): polymers
10. Electrochemical properties of semiconductors (1): inorganic semiconductors
11. Electrochemical properties of semiconductors (2): organic semiconductors
12. Electronic interactions between metals and semiconductors
13. Electronic interactions between semiconductors and redox species in solutions
14. Carbon materials: molecular structures and electronic states of fullerenes
15. Carbon nanotubes
16. A term examination

Evaluation Criteria〉 Reports worth a total of 50% of the course grade will be given. A term examination (50%) will be given as in-class closed-book examination.

Textbook〉 will be introduced in the lecture.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125302/

Contact〉 Tezuka (Opt.307, +81-88-656-9423, ytezuka@opt.tokushima-u.ac.jp)

Electronic diaplay

Undecided (2 units)

Target〉 To understand the history of developments, technical trends, and technologies of electronic display.

Outline〉 This course will cover the history of developments, technical trends, recent topics, and technologies of an electronic display. This course is related to indutories.

Style〉 Lecture

Goal〉

1. To understand fundamental technologies of an electronic display
2. To understand fundamental technologies of devices for an electronic display
3. To understand a technical trend of an electronic display

Schedule〉

1. History and tchnical trends of an electronic display
2. Acquisition, communication, and display of image data
3. Cathode-ray tube
4. Plasma display panel
5. Fluorescent display tube
6. Electroluminescence display
7. Light-emittind diode display
8. Liquid crystal diaplay
9. Electrochromic diaply
10. Field-emmision display
11. Electrophoretic display
12. Projection display
13. Liquid crystal projector
14. Digital micromirror device projector
15. Electronic paper, Digital paper

Evaluation Criteria〉 Evaluation with report

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125303/

Student〉 Able to be taken by only specified class(es)

Optical computing

Associate Professor · Yoshio Hayasaki (2 units)

Target〉 To understand analog optical computing. To understand digital optical computing. To understand optelectronic computing.

Outline〉 We study fundamantal technologies of architectures, implementation, and packaging in analog and digital optical processing, and prototype system developed with these technolgies. We also study recent technologies in related photonics, electronics, and other technologies.

Style〉 Lecture

Goal〉

1. To understand optical computing
2. To create new information photonics

Schedule〉

1. Fundamentals of optical computing (1)
2. Fundamentals of optical computing (2)
3. Fundamentals of optical computing (3)
4. Light source and detector in optical computing
5. Optical modulator in optical computing
6. Analog optical computing (1)
7. Analog optical computing (2)
8. Digital optical computing (1)
9. Digital optical computing (2)
10. Optica memory
11. Optica communication
12. Recent optical computing technology (1)
13. Recent optical computing technology (3)
14. Recent optical computing technology (3)
15. Recent optical computing technology (4)

Evaluation Criteria〉 Evaluated with reports

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125304/

Student〉 Able to be taken by only specified class(es)

Virtual Reality

Professor · Noboru Niki (2 units)

Target〉 Introduction to the fundamental concepts of virtual reality.

Outline〉 Virtual Reality is a combination of human interface, graphics, sensor technology, high performance computing, and networking. It allows the user to interact with an artificial environment created by computers. Using these technologies, one has the feeling of total immersion in a new environment. Here, these technologies and several VR simulations are described.

Requirement〉 It is desired to finish a course of digital signal processing, image processing, and pattern recognition .

Goal〉

1. To understand fundamentals of virtual reality.
2. To understand various techniques for realizing virtual environments.

Schedule〉

1. 1. Introduction
2. Mathematical Fundamentals (Image Processing)
3. Mathematical Fundamentals (Pattern Recognition)
4. Computer Graphics
5. Three-dimensional Coordinate System
6. Geometrical Modeling
7. Hidden Line and Surface Removal Methods
8. Advanced Rendering Topics
9. Real Time Computer Graphics
10. Image Processing of Motion Pictures
11. Image Sensing Technology
12. Virtual Reality Systems
13. Augmented Reality Systems
14. Advanced Applications of Virtual Reality 1
15. Advanced Applications of Virtual Reality 2
16. Final Examination

Evaluation Criteria〉 Project Report 60%, Final Examination 40%

Textbook〉 Reference books are introduced to each topic.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125305/

Imaging Technology

Associate Professor · Yoshiki Kawata (2 units)

Target〉 Introduce the fundamental concepts of imaging systems.

Outline〉 This course is intended to introduce the fundamentals of the imaging technology which produces cross-sectional images of an object from transmission, reflection, emission, and diffraction data collected by illuminating the object from many different directions. The class begins with a brief overview of the various technologies used to obtain medical and industrial images. The focus then shift to in-depth descriptions of individual techniques, beginning with a description of the mathematical technique of computed tomography. This will be followed by discussions of imaging modalities such as X-ray Computer Tomography, Single Photon Emission Computed Tomography, Positron Emission Tomography, Magnetic Resonance Imaging, and Optical Computed Tomography.

Keyword〉 Imaging Technology, Imaging systems, X-ray Computer Tomography, Magnetic Resonance Imaging, Emission CT

Relational Lecture〉 "Virtual Reality"(0.5, ⇒270 page)

Requirement〉 It is desired to finish a course of digital signal processing, image processing, and programming (C or C++).

Goal〉

1. To understand fundamentals of imaging technology.
2. To understand various imaging technologies used to obtain medical and industrial images.

Schedule〉

1. Introduction to Imaging Technology
2. Signal Processing Fundamentals
3. Image Processing Fundamentals
4. Image Quality
5. Radiography Fundamentals
6. Computed Tomography
7. Image Reconstruction (1)
8. Image Reconstruction (2)
9. Nuclear Medical Imaging
10. Emission Computed Tomography
11. Ultrasound Imaging
12. Magnetic Resonance Imaging(1)
13. Magnetic Resonance Imaging(2)
14. Micro Computed Tomography
15. Advanced CT Application

Evaluation Criteria〉 Computer Project Report 100%

Textbook〉 Reference books are introduced to each topic.

Reference〉

◇ Principles of Comuterized Tomographic Imaging, A.C. Kak, M. Slaney, 1988
◇ 画像処理アルゴリズム，斎藤恒雄，近代科学社,1992
◇ Medial Imaging Signals and Systems, J.L. Prince, J.M. Links, 2006

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125306/

Contact〉 Kawata (Opt.508, +81-88-656-9431, kawata@opt.tokushima-u.ac.jp)

Note〉 The computer projects should be done in C or C++.

Lecture in Optical Materials and Devices, Part 1

Professor · Masuo Fukui, · Part-time Lecturer (1 unit)

Target〉 To understand the current trends of the optical and/or optoelectronic materials and devices.

Outline〉 This course will cover several several topics on the current trends of the optical and/or optoelectronic materials and devices. Topics treated are focused on the latest fabrication technology and the research for the device application.

Style〉 Lecture

Keyword〉 semiconductor, LED, Laser Diode

Relational Lecture〉 "Advanced Optical and Optoelectronic Devices"(0.5, ⇒263 page), "Optical propertics of materials"(0.5, ⇒262 page)

Requirement〉 Students must have enough knowledges of semiconductor physics comparable to contents in lectures on semiconductor physics for undergraduate students.

Goal〉

1. To understand advantages of Nitride semiconductors compared with other semiconductors.
2. To understand the outline of technologies for fabrication process of optoelectronic devices
3. To understand trends of developments and researches for optoelectronic devices

Schedule〉

1. guidance
2. semiconductor materials for optoelectronic devices
3. Advantages of Nitride semiconductor
4. Fabrication of optoelectronic devices by Nitride semiconductor
5. Principle of light emitting diode and laser diode
6. History of development for semiconductor light emitting deices
7. Trends on the development of high power light emitting diode
8. Trends on the development of UV light emitting diode
9. Trends on the development of UV and Blue laser diodes
10. Applications of light emitting diode
11. Applications of laser diode
12. 予備日

Evaluation Criteria〉 Activity and attendance 40%, reports 60%

Textbook〉 no text

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125307/

Contact〉 Fukui (Opt.208, +81-88-656-9410, fukui@opt.tokushima-u.ac.jp)

Lecture in Optical Materials and Devices, Part 2

Professor · Tetsuo Inoue (1 unit)

Target〉光学結晶の結晶成長について最近の話題や今後の展望について理解させる

Outline〉Recent topics about the crystal growth of key materials are lectured. This lecture has a concern with the engineering of optics.

Style〉Lecture

Keyword〉crystal growth, optical crystals, crystal growing techniques, crystal perfection, epitaxial growth

Fundamental Lecture〉"Advanced Lecture in Crystal Growth"(1.0, ⇒265 page)

Relational Lecture〉"Advanced Lecture in Crystal Growth"(0.5, ⇒265 page), "Advanced Lecture in Statistical Mechanics and Thermidynamics"(0.5, ⇒264 page), "Advanced Optical and Optoelectronic Devices"(0.5, ⇒263 page)

Goal〉To understand the recent topics about crystal growth of optical materials

Schedule〉

1. History of crystal growth
2. Growth method of Si crystal
3. Defects in Si crystal
4. Crystal growth of semiconductor compounds (1)
5. Crystal growth of semiconductor compounds (2)
6. Crystal growth of oxides
7. Crystal growth of organic materials
8. Examination

Evaluation Criteria〉Examination (20%), Attitude(20%)

Textbook〉Diistribution of teaching materials

Contents Area〉http://cms.db.tokushima-u.ac.jp/DAV/lecture/125308/

Student〉Able to be taken by student of other faculty and university

Contact〉Inoue (Opt.310, +81-88-656-9416, inoue@opt.tokushima-u.ac.jp)

Lecture in Optical Materials and Devices, Part 3

Professor · Hitoshi Tanaka (1 unit)

Target〉 This class addresses the recognition of the optical materials and devices from a chemical point of view.

Outline〉 This cource will focus on the fundamentals and current topics in chemical preparaton, reaction, structure, and functionality of the optical materials and devices.

Keyword〉 photo-functional materials

Relational Lecture〉 "Macromolecular Design"(0.5, ⇒266 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level photochemistry.

Goal〉

1. To understand the exact nature of the optical properties of materials.
2. To understand the precise procedure to design and evaluate the optical materials and devices.

Schedule〉

1. Introduction to optical materials and devices for this class
2. Photochemical process (1)
3. Photochemical process (2)
4. Photophysicalchemistry (1)
5. Photophysicalchemistry (2)
6. Interaction between light and media (1)
7. Interaction between light and media (2)
8. Interaction between light and media (3). Final test

Evaluation Criteria〉 Final test: 100%

Textbook〉 Hikarikinoubunshi no Kagaku ed. by K. Horie and H. Ushiki (Kodansha)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125309/

Contact〉 H. Tanaka (Opti. Build. Room 211, Phone & Fax: 088-656-9420, E-mail: tanaka@opt.tokushima-u.ac.jp)

Lecture in Optical Information Systems, Part 1

Associate Professor · Yoshio Hayasaki, · Undecided (1 unit)

Target〉 Introduction to recent topics on optical information processing.

Outline〉 This course introduces recent technical information on optical information processing and the required future technology.

Keyword〉 Infomation photonics, Optical computing

Goal〉

1. To understand the recent topics of optical information systems
2. To consider a next generation of optical information systems

Schedule〉

1. History of the development of optcail information instruments
2. Recent topics of optical disk systems (1)
3. Recent topics of optical disk systems (2)
4. Recent topics of optical disk systems (3)
5. Recent topics of optical disk systems (4)
6. Recent topics of display systems (1)
7. Recent topics of display systems (2)
8. Recent topics of display systems (3)
9. Recent topics of display systems (4)
10. Recent topics of optical information systems (1)
11. Recent topics of optical information systems (2)
12. Recent topics of optical information systems (3)
13. Recent topics of optical information systems (4)
14. Next generation of optical information systems (1)
15. Next generation of optical information systems (2)

Evaluation Criteria〉 Report 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125310/

Lecture in Optical Information Systems, Part 2

Professor · Noboru Niki (1 unit)

Target〉 Introduction to recent topics on imaging technologies and intelligent image processing.

Outline〉 This course introduces recent technical information on imaging technologies and intelligent image processing and describes their future directions.

Keyword〉 Imaging technologies, Intelligent image processing

Relational Lecture〉 "Imaging Technology"(0.5, ⇒271 page), "Virtual Reality"(0.5, ⇒270 page)

Goal〉 To understand the recent topics on imaging technologies and intelligent image processing.

Schedule〉

1. Recent topics of three-dimensional CT technologies (1)
2. Recent topics of three-dimensional CT technologies (2)
3. Recent topics of three-dimensional CT technologies (3)
4. Recent topics of three-dimensional CT technologies (4)
5. Recent topics of three-dimensional CT technologies (5)
6. Recent topics of MR imaging technologies (1)
7. Recent topics of MR imaging technologies (2)
8. Recent topics of MR imaging technologies (3)
9. Recent topics of MR imaging technologies (4)
10. Recent topics of MR imaging technologies (5)
11. Recent topics of intelligent image processing (1)
12. Recent topics of intelligent image processing (2)
13. Recent topics of intelligent image processing (3)
14. Recent topics of intelligent image processing (4)
15. Recent topics of intelligent image processing (5)

Evaluation Criteria〉 Report 100%

Textbook〉 Reference books are introduced to each topic.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125311/

lecture in optical system engineering

Part-time Lecturer (1 unit)

Target〉 topics in optical technology

Outline〉 Lecure on the trend in optical technologies such as nano-technology, bio-technology, and information communication, and medical science.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125312/

Practice of presentation

Teacher of course (1 unit)

Target〉 Learning a skill of presentation

Outline〉 Fundamental skills for the presentation are learned such as (1) to explain the contents of research, (2) to adjust the contents with audience's level, (3) to create the original drawing, and (4)the way of answering against a question etc.

Keyword〉 oral presentation

Goal〉 Learning a foudamental skill for presentation

Schedule〉

1. Presentation (1)
2. Presentation (2)
3. Presentation (3)
4. Presentation (4)
5. Presentation (5)
6. Presentation (6)
7. Presentation (7)
8. Presentation (8)
9. Presentation (9)
10. Presentation (10)
11. Presentation (11)
12. Presentation (12)
13. Presentation (13)
14. Presentation (14)
15. Presentation (15)

Evaluation Criteria〉 Presentation skill (80%), Attitude(20%)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125316/

Student〉 Able to be taken by only specified class(es)

Intellectual Production Techonology Seminar

(1 unit)

Target〉 To master skills for novel intellectual production

Outline〉 As one of technique for for novel intellectual production, practice mehods those are the combination of brainstorming and KJ mathod

Goal〉

1. To understand what is intellectual production techonology
2. To use an intellectual production techonology that is combination of brainstorming and KJ method

Schedule〉

1. neccessary
2. Hhow to practice
3. what is brainstorming
4. practice of brainstorming
5. case studies
6. what is KJ method
7. practice of KJ method
8. practice of KJ method
9. practice of KJ method
10. case studies
11. practice of KJ method
12. practice of KJ method
13. practice of KJ method
14. case studies
15. presentation
16. 予備日

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125317/

Optical System Eigineering Seminar, Part 1

Teacher of course (2 units)

Target〉 Through seminars concerning the thema of the master's thesis, to learn the wide culture and professional knowledge, to have interest in unknown arer, and to obtain ability to learn spontaneously knowledges which are lacked.

Outline〉 To discuss on the paper concering the thema of the master's thesis in a semin with proffesors, and make presentation on those contents and results under development in student's research work.

Goal〉

1. to master wide varieties in cultur in optical system engineering and ability to apply them
2. to master professional knowlegdes in optical system engineering and ability to apply them
3. to have interest in unknown area in optical system engineering and spontaneouly learn knowledges which are lacked

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125318/

Optical System Eigineering Seminar, Part 2

Teacher of course (4 units)

Target〉 Through seminars concerning the thema of the master's thesis, to learn the professional knowledges and skills, to obtain the ability to apply them , to obtain ability to learn spontaneously knowledges which are lacked, and furthermore to developm the comunication and roles in the research work, and to obtain the ability to make management in collaboration project.

Outline〉 To discuss on the paper concering the thema of the master's thesis, and make presentation in the student's research group.

Goal〉

1. to master professional knowklegdes and skills in optical system engineering and ability to apply them
2. to learn knowledges which are lacked in optical system engineering
3. to develop the communication and role in the research work and to manage the collaboration project

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125319/

Optical System Engineering Laboratory

Teacher of course (6 units)

Target〉

Outline〉 Experiment concerning master's thesis.

Goal〉

1. to master knowlegdes and skills in engineering and ability to apply them
2. ability fo find problems, set up, analize, and solve
3. spontaneouly learn knowledges if lacked

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125320/

Systems Innovation Engineering — Optical Systems Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Management of Technology ..... WEB page, CMS
  - Presentation Method (M) ..... WEB page, CMS
  - Internship (M) ..... WEB page, CMS
  - Venture Business (M) ..... WEB page, CMS
- *Common Subjects*
  - Advanced Theory of Complex System Engineering ..... WEB page, CMS
  - Advanced Theory of Electromagnetic Compatibility ..... WEB page, CMS
  - Advanced Lecture of E-business ..... WEB page, CMS
- *Basic Departmental Subjects*
  - Superconductivity and superconducting materials ..... WEB page, CMS
  - Topics of mathematical physics ..... WEB page, CMS
  - Methods for analysis of mathematical phenomena ..... WEB page, CMS
  - Advanced Computational Science ..... WEB page, CMS
- *Applied Departmental Subjects*
  - Optical propertics of materials ..... WEB page, CMS
  - Advanced Optical and Optoelectronic Devices ..... WEB page, CMS
  - Advanced Lecture in Statistical Mechanics and Thermidynamics ..... WEB page, CMS
  - Advanced Lecture in Crystal Growth ..... WEB page, CMS
  - Macromolecular Design ..... WEB page, CMS
  - Advanced Materials Chemistry ..... WEB page, CMS
  - Electronic diaplay ..... WEB page, CMS
  - Optical computing ..... WEB page, CMS
  - Virtual Reality ..... WEB page, CMS
  - Imaging Technology ..... WEB page, CMS
  - Lecture in Optical Materials and Devices, Part 1 ..... WEB page, CMS
  - Lecture in Optical Materials and Devices, Part 2 ..... WEB page, CMS
  - Lecture in Optical Materials and Devices, Part 3 ..... WEB page, CMS
  - Lecture in Optical Information Systems, Part 1 ..... WEB page, CMS
  - Lecture in Optical Information Systems, Part 2 ..... WEB page, CMS
  - lecture in optical system engineering ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Practice of presentation ..... WEB page, CMS
  - Intellectual Production Techonology Seminar ..... WEB page, CMS
  - Optical System Eigineering Seminar, Part 1 ..... WEB page, CMS
  - Optical System Eigineering Seminar, Part 2 ..... WEB page, CMS
  - Optical System Engineering Laboratory ..... WEB page, CMS

Chapter 2

DOCTOR’s DEGREE

Intelligent Structures and Mechanics Systems Engineering

Intelligent Structures and Mechanics Systems Engineering — Civil and Environmental Engineering
Syllabus of subjects

List of Subjects

Human Factors

Part-time Lecturer · Atsuya Yoshida (2 units)

Target〉 The objective of this class is to provide students with sufficiently thorough appreciation of the many facets of the human factors discipline so that they may make use of it to their own doctoral works.

Outline〉 This class offers a broad and comprehensive overview of the human factors/ergonomics discipline with four areas of emphasis, (1) historical review of human factors research, (2) human physical, perceptual and cognitive capabilities and limitations, (3) application of human factors research data in design, especially in the interface design of computer-based systems, and (4) discussion about the relationship between the designed system (technology) and people.

Schedule〉

1. What is Human Factors
2. Historical Overview of Human Factors
3. Multi-Disciplinary Aspect of Human Factors
4. Health and Safty Issue of Human Factors
5. Human Psychological Capability
6. Task Analysis
7. Human Error
8. Universal Design
9. Cognitive Artifact
10. Visibility and Affordance
11. Human-Computer Interaction
12. Human Information Processing
13. Knowledge and Mental Model
14. Usability Paradigms and Principles
15. Evaluation and Testing
16. Making system that makes us smart

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124976/

Life Science

Part-time Lecturer · Hiroshi Takagi, *Professor* · Akihiko Tsuji (2 units)

Target〉 Understanding of significance of protein in biotechnology

Outline〉 Basics of structure, function and application of protein are introduced

Style〉 Lecture

Keyword〉 Protein, Enzyme, Biotechnology

Goal〉

1. Understanding of multiple functions of proteins
2. Understanding of principle of protein engineering and its application

Schedule〉

1. Introduction of life science
2. History of life science
3. Structure and function of DNA and RNA
4. mRNA is a template of protein
5. Duplication of DNA
6. Regulation of protein expression
7. Human Genetics
8. Genetic disease
9. DNA diagnosis
10. Structure and function of protein
11. Principle of gene technology (1)
12. Principle of gene technology (2)
13. Protein engineering
14. Future of life science (1)
15. Future of life science (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124977/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Social Science

Part-time Lecturer · (2 units)

Target〉 The mutual relationship of economic activities, the structure and function of economic society, and the concept and technique of mathematical programming modelling are lectured.

Outline〉 Not only the mutual relationship of economic activities is explained from domestic and international points of view, but also the technique of case studies by application of mathematical programming models is tought using the various kinds of materials and examples.

Keyword〉 Economic activities, Structure and function, Mathematical programming model

Goal〉 To understand the mutual relationship of economic activities, empirically explain them using the mathematical programming model and evaluate the model.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of economic activities 1
3. Examples of economic activities 2
4. Examples of economic activities 3
5. Change in structure of economic society 1
6. Change in structure of economic society 2
7. Function of economic society 1
8. Function of economic society 2
9. Mutual relationship of economic activities 1
10. Mutual relationship of economic activities 2
11. Concept of mathematical programming model
12. Technique of model construction
13. Modelling of economic activities 1
14. Modelling of economic activities 2
15. Evaluation of modelling

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124978/

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Science and Technology Studies

Part-time Lecturer · (2 units)

Target〉 Let to learn the minimum essentials of science and technology studies and its function in contemporary society.

Outline〉 The science and technology studies deal with science and technology research and its outcomes by means of various methods of social science and humanities. The discipline emerged in 1930s when social importance of science and technology became evident. Since 1970s, the science and technology studies have developed as mission oriented learning for government policy, buisiness administrations and civic activity. students are expected to learn the outline of this discipline : the philosophy of science, history of science and technology, and sociology of science and technology, as well as their application to the problems in contemporary society since 1970s.

Style〉 Lecture

Goal〉

1. Understanding of the minimum essentials of the science and technology
2. Understanding of the social meaning of each student's research

Schedule〉

1. Introduction: A brief history of the science and technology studies since 1930s
2. Philosophical understanding of science: (1) Greek classics and scholastic study
3. Philosophical understanding of science: (2) Science study in Enlightenment and German Classics
4. Philosophical understanding of science: (3) Rise of the philosophy of science in the early twentieth century
5. Historical investigation of science and technology : (1) Emergence of the modern science
6. Historical investigation of science and technology : (2) technology in the Medieval West and the non -Western World
7. Historical investigation of science and technology : (3) Significance of the Industrial Revolution
8. Sociology of science and technology: (1) Normative structure and Paradigm
9. Sociology of science and technology: (2) Social constructivism and Laboratory life analysis
10. The 1950s model of science and technology policy in the Cold War
11. Innovation and Science and Technology
12. Knowledge industrial society since 1970s: (1) Environmental problem and energy prpblem
13. Knowledge industrial society since 1970s: (2) Computer science and Information society
14. Science and technology in the global economy since 1990s
15. Concluding remark: Science and technology in the future

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124979/

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124980/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124981/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Presentation Method (D)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124982/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (D)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal. (2)
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124983/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (D)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124984/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Engineering of Correlated Electron Matter

Professor · Yutaka Kishimoto, *Assistant Professor* · Yu Kawasaki (2 units)

Target〉 In many solid-state materials, new phenomena evolve due to strong electron interactions. In this Lecture, review will be given on some advanced topics and their applications, including high temperature superconductivity, metal-insulator transition and strongly correlated electronics.

Outline〉 New types of superconducting and magnetic phenomena emerge in correlated electron matters. The term "correlated electron" represents the state of matter where many electrons are strongly interacting with each other. After an introductory talk on magnetism and superconductivity, review will be given on some advanced topics, including high temperature superconductivity, metal-insulator transition and colossalmagneto resistance. Potential application of correlated electron matters to technology is also presented focusing on spintronics or strongly correlated electronics.

Style〉 Lecture

Keyword〉 strongly correlated electron systems, Mott insulator, colossalmagneto resistance, high temperature superconductor

Goal〉 To understand basic concepts of correlated electron matter and its application

Schedule〉

1. Introduction to correlated electron matters
2. Perspectives of magnetism and superconductivity in correlated electron matters
3. Electronic states of atoms and ions
4. Magnetic ions in crystal electric field
5. Introduction to superconductivity
6. How to probe rich properties in correlated electron matters
7. Mott insulator and metal-insulator transition
8. Spin, charge and orbital in transition metal oxides
9. Colossalmagneto resistance in transition metal oxides
10. Application of transition metal oxides with correlated electrons
11. High temperature superconductivity
12. Heavy-fermion superconductivity
13. Electronic states of organic conductors
14. Application of superconductors with correlated electrons
15. Towards strongly correlated electronics

Evaluation Criteria〉 Reports on several subjects in lecture

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124985/

Contact〉

⇒ Kishimoto (A202, +81-88-656-7548, yutaka@pm.tokushima-u.ac.jp)
⇒ Kawasaki (A217, +81-88-656-9878, yu@pm.tokushima-u.ac.jp)

Quantum Theory of Materials

Associate Professor · Yoshitaka Michihiro (2 units)

Target〉 This class introduces the advanced quantum mechanics and quantum field theory.

Outline〉 Basics of advanced quantum mechanics and quantum field theory are introduced.

Style〉 Lecture

Goal〉 To understand the outline of advanced quantum mechanics and quantum field theory.

Schedule〉

1. Introduction
2. Quantum mechanics (1)
3. Quantum mechanics (2)
4. Hartree-Fock approximation
5. Koopman's theorem
6. Density functional theory
7. Kohn-Sham equation
8. Local density approximation
9. Perturbation (1)
10. Perturbation (2)
11. Quantum field theory
12. Creation operator and annihilation operator
13. Field quantization
14. Phonon
15. Electron gas

Evaluation Criteria〉 Assignments count 100%.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124986/

Contact〉 Yoshitaka Michihiro (A203)

Simulation Aided Mathematical Sciences

Professor · Hitoshi Imai, Toshiki Takeuchi (2 units)

Target〉 This class provides the basic technology for advanced numerical simulation.

Outline〉 Basic technology for advanced numerical simulation is introduced.

Style〉 Lecture

Keyword〉 Numerical simulation, Advanced

Fundamental Lecture〉 "Numerical Analysis"(1.0)

Relational Lecture〉 "Methods for analysis of mathematical phenomena"(0.5, ⇒61 page), "Advanced Computational Science"(0.5, ⇒60 page)

Requirement〉 Students have to understand basic mathematics of undergraduate-level.

Goal〉 To understand principle of Infinite-Precision Numerical Simulation.

Schedule〉

1. Introduction of computer science
2. Multiple precision arithmetic 1
3. Multiple precision arithmetic 2
4. Iteration method 1
5. Iteration method 2
6. Parallel computing 1
7. Parallel computing 2
8. Spectral method 1
9. Spectral method 2
10. Infinite-Precision Numerical Simulation 1
11. Infinite-Precision Numerical Simulation 2
12. Numerical simulation of free boundary problem 1
13. Numerical simulation of free boundary problem 2
14. Numerical simulation of inverse problem 1
15. Numerical simulation of inverse problem 2

Evaluation Criteria〉 Assignments count 100%.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127915/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Imai(A220, +81-88-656-7541, The inquiry by means of the cellular phone or E-mail is not acceptable)Office hours: Thursday 14:00-15:00

⇒ Takeuchi (A206, +81-88-656-7544, takeuchi@pm.tokushima-u.ac.jp)

Nonlinear Analysis

Associate Professor · Nobuyoshi Fukagai, Atsuhito Kohda (2 units)

Target〉 Introduction to nonlinear functional analysis.

Outline〉 Methods of nonlinear analysis; fundatmental mathematical theories and techniques of ordinary and partial differential equations.

Style〉 Lecture

Goal〉 To be familiar with mathematical concepts, ideas and tools involved in doing nonlinear mathematics.

Schedule〉

1. Introduction
2. Mathematical modelling 1
3. Mathematical modelling 2
4. Mathematical modelling 3
5. General topology
6. Function space 1
7. Function space 2
8. Function space 3
9. Integral operator
10. Contraction mapping theorem
11. Example
12. Variational methods 1
13. Variational methods 2
14. Variational methods 3
15. Minimax principles

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127916/

Contact〉 工学部数学教室 (A 棟 211 室，219 室)

Watershed Hydrologic Engineering

Professor · Michio Hashino (2 units)

Target〉 The purpose of this subject is to learn models and theories on hydrological and chemical cycles in a river watershed.

Outline〉 Watershed hydrologic system. Watershed hydrologic processes. Evaporation and transpiration processes. Lumped and distributed rainfall-runoff models. Canopy interception tank model. Heat-pulse transpiration model. Mathematical models of solute runoff process for forested watersheds. Water and solute budgets for forested watersheds. Management system of flood, water resources, and watershed environment.

Style〉 Lecture

Goal〉

1. Understand models and theories on hydrological cycels
2. Understand models and theories on chemical solute cycles

Schedule〉

1. Hydrologic Cycle in a River Watershed
2. Rainfall Interception Process in a Forest Watershed
3. Transpiration Process in a Forest Watershed
4. Runoff Process in a Forest Watershed
5. Modeling of Overland flow
6. Distributed Runoff Models
7. Modeling of Hydrologic Cycle in a River Watershed (1)
8. Modeling of Hydrologic Cycle in a River Watershed (2)
9. Evaluation Index of Hydrologic Cycle in a River Watershed
10. Formation Process of Streamwater Chemistry in a Forest Watershed
11. Runoff Process of Chemical Solutes in Streamwater
12. Inference of Forest Change to Streamwater Chemistry
13. Mathematical Model of Solute Runoff in Streamwater (1)
14. Mathematical Model of Solute Runoff in Streamwater (2)
15. Modeilng of Water and Solute Cycles in a River Watershed
16. Water and Solute Budgets in a River Watershed

Evaluation Criteria〉 Reports

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124987/

Ecological Hydroengineering

Professor · Takeshi Okabe, *Associate Professor* · Susumu Nakano, Mahito Kamada, Hiroshi Takebayashi (2 units)

Target〉 Methods for conserving and improving riparian and coastal ecosystems in an actual way are developed, both from hydraulic and ecological perspectives.

Outline〉 Hydrodynamics of open-channel flow and wave in river, estuary. Mechanics of sediment transport by open-channel flow and wave. Theoretical and numerical analysis of hydro-geomorphic process. Influence of physical condition on ecological system. Interactive dynamics between hydro-geomorphic process and plant communities. Ecological assessment and restoration of riparian ecosystems. Landscape management in an ecological way.

Style〉 Lecture in combination with Portfolio, Portfolio

Keyword〉 ecosystem, river, estuary, watershed, landscape management

Fundamental Lecture〉 "Advanced Environmental Ecology"(1.0, ⇒26 page), "Applied Fluid Dynamics"(1.0, ⇒11 page)

Relational Lecture〉 "Advanced mitigation engineering"(0.5, ⇒313 page), "Watershed Hydrologic Engineering"(0.5, ⇒301 page)

Requirement〉 not specified

Notice〉 not specified

Goal〉

1. Students understand mechanism and analysis technique for flow and sediment transport in the middle and upper reaches of a river.
2. Students understand analysis technique for flow and material transport in estuary, and are able to evaluate correctly the relation between physical phenomena and esturine ecosystem.
3. Students have knowledge to evaluate ecosystem value, and are able to apply for ecosystem improvement.
4. Students have knowledge on prediction method of river geometry and bed material size.

Schedule〉

1. Governing equation of hydro-geomorphic process
2. Numerical analysis of hydro-geomorphic process
3. Statistical analysis of hydro-geomorphic process
4. Interaction between hydro-geomorphic process and vegitation, report(1)
5. Flow analysis in estuary
6. Flow analysis in coastal zone
7. Wave analysis in coastal zone
8. Evaluation model of ecosystem in coastal zone, report(2)
9. Finding the limiting factors of ecosystem distribution
10. Mechanism for sustaining ecosystems
11. Pattern and process of ecosystem change
12. Mechanism of ecosystem alteration in relation to human activities
13. Ecological management of landscape and landscape ecology 1
14. Ecological management of landscape and landscape ecology 2
15. Ecological engineering for ecosystem management, report(3)

Evaluation Criteria〉 marks of report (1) , (2) and (3) are summed with the weights of 3 ,3 and 4, respectively, and the passing mark is 60%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124988/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Okabe (A309, +81-88-656-7329, okabetak@ce.tokushima-u.ac.jp)
⇒ Nakano (A310, +81-88-656-7330, nakano@ce.tokushima-u.ac.jp)
⇒ Kamada (A306, +81-88-656-9134, kamada@ce.tokushima-u.ac.jp)
⇒ Takebayashi (A311, +81-88-656-7331, takeh@ce.tokushima-u.ac.jp)

Geoenvironmental Design Theory

Professor · Takuo Yamagami, *Associate Professor* · Hisashi Suzuki (2 units)

Target〉 The purpose of this course is to present state-of-the-art theories of geomechanics which contribute to the well-balanced development and conservation of the geoenvironment. The course consists of two main parts: stability analyses and deformation theories of earth structures.

Outline〉 In the stability analyses, theories of limit equilibrium methods, limit analysis methods and slip line methods, as well as their applications to stability, bearing capacity and earth pressure problems are addressed. In the deformation theories, the original Cam Clay Model and the latest developments in critical state soil mechanics together with finite element methods are described.

Style〉 Lecture

Keyword〉 Stability problem, Deformation problem

Fundamental Lecture〉 "Advanced Geomechanics"(1.0, ⇒25 page), "Advanced Soil Mechanics"(1.0, ⇒27 page)

Relational Lecture〉 "Geoenvironment Control Engineering"(0.5, ⇒304 page)

Goal〉

1. To understand strength theories of earthen structures
2. To understand deformation theories of geo- materials

Schedule〉

1. Introduction of stability problems
2. Limit equilibrium method (part 1)
3. Limit equilibrium method (part 2)
4. Limit analysis (part 1)
5. Limit analysis (part 2)
6. Slip line method (part 1)
7. Slip line method (part 2)
8. Progressive failure analysis of stability problems
9. Introduction of deformation problems and growth of Cam-clay theory
10. Existence of Critical State Line
11. Existence of Roscoe Surface
12. Existence of Hvorslev Surface
13. Elasto-plastic theory of saturated clay
14. Associate flow rule for yield surface of soil
15. Equation for State Boundary Surface of Cam-clay Model

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124989/

Student〉 Able to be taken by only specified class(es)

Contact〉 Yamagami (A401, +81-88-656-7345, takuo@ce.tokushima-u.ac.jp)

Geoenvironment Control Engineering

Professor · Akitoshi Mochizuki, *Assistant Professor* · Katsutoshi Ueno (2 units)

Target〉 This unit aims to cover basic concepts and technologies related to development and control of geoenvironment and ground-structure system for protection against natural and human-caused disasters. Interactive behaviours of over and under-ground structures under earthquake conditions as well as static conditions will be addressed employing results from numerical and physical models as well as those from field-observation data.

Outline〉 i)Learn framework of experimental apparatus and instruments for in-situ investigation and so forth. Then understand their basic principle, modification and basic comcepts. ii)practice of the method how to review techincal papers

Keyword〉 Constitutive equation, Centrifuge model test, True triaxitial compression test, Direct shear test

Goal〉 To understand methodology of engineering, i.e. experiments, site investigation, and their verification by analysis, and to develope basic ability in delopment of experimental equipments and instulments.

Schedule〉

1. General
2. Aims of model test, simirality rule(1)
3. Simirality rule(2)
4. Aim and porpus of centrifuge model tests
5. Examples of centrifuge model test (1)
6. Examples of centrifuge model test (1)
7. True triaxial compression test apparatus and constitutive equation(1)
8. True triaxial compression test apparatus and constitutive equation(1)
9. True triaxial compression test apparatus and constitutive equation(1)
10. Direct shear apparatus and creep test(1)
11. Direct shear apparatus and creep test(2)
12. Preparation on English paper(1)-1
13. Preparation on English paper(1)-2
14. Preparation on English paper(2)-1
15. Preparation on English paper(2)-2

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124990/

Contact〉

⇒ Mochizuki (A405, +81-88-656-9721, motizuki@ce.tokushima-u.ac.jp)
⇒ Ueno (A406, +81-88-656-7342, ueno@ce.tokushima-u.ac.jp)

Urban System Analysis

Professor · Hideo Yamanaka, *Assistant Professor* · Susumu Namerikawa (2 units)

Target〉 Basic theories on modeling analysis for land use, transportation and environment systems in urban and regional areas. Design, planning, construction, and management systems for regions.

Outline〉 Yamanaka: Modeling, analysis methods, design and planning method for land use, transportation, and environment systems in urban/ regional areas. Namerikawa: Analysis models, building, management and maintenance methods for infrastructure and environment systems in urban/ regional areas

Style〉 Portfolio

Keyword〉 Landuse Analysis, Transport Model, Environment Protection

Fundamental Lecture〉 "City and Transport System Planning"(1.0, ⇒28 page), "Urban and Regional Planning"(1.0), "Project Management"(1.0, ⇒15 page)

Relational Lecture〉 "Advance Lecture of Political Simulation"(0.5, ⇒311 page), "Advanced Lecture in Social Risk Engineering"(0.5, ⇒312 page), "Social Science"(0.5, ⇒290 page)

Goal〉

1. To understand the theoryies of modeling method for the analysis of landuse, transport, environments system in urban nad regional areas.
2. To understand project management system in regional develepments.

Schedule〉

1. Discussion on chosing topics 1
2. Discussion on chosing topics 2
3. Review on related researches 1
4. Review on related researches 2
5. Review on related researches 3
6. Review on related researches 4
7. Review on related researches 5
8. Review on related researches 6
9. Case study using a analysis method 1
10. Case study using a analysis method 2
11. Case study using a analysis method 3
12. Case study using a analysis method 4
13. Case study using a analysis method 5
14. Discussion on summary of case study 1
15. Discussion on summary of case study 2

Evaluation Criteria〉 No paper is required. The portforio of learning records and submitted reports are reqiured to be evaluated.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124991/

Student〉 Able to be taken by student of other department

Contact〉

⇒ Yamanaka (A410, +81-88-656-7350, yamanaka@ce.tokushima-u.ac.jp)
⇒ Namerikawa (A412, +81-88-656-9877, namerikawa@ce.tokushima-u.ac.jp)

Wind Engineering

Associate Professor · Fumiaki Nagao (2 units)

Target〉 To understand the properties of strong wind, outline of structural behavior in strong wind and wind resistant design in civil engineering

Outline〉 Local strong wind; Occurrence mechanism and effect of geographic and topographic factors. Characteristics of fluctuating wind velocity. Steady and unsteady aerodynamic forces exerted on thin and bluff bodies. Aerodynamic response analyses of structures such as cables, tower-like structures, cable stayed bridges and suspension bridges. Rain-wind induced vibration. Effect of gusty wind on structural response. Wind resistant design in civil engineering; A state of the art and perspective.

Style〉 Lecture

Keyword〉 properties of strong wind, structural behavior in strong wind, wind resistant design

Fundamental Lecture〉 "Advanced Structural Dynamics"(1.0, ⇒12 page), "Advanced Structural Design"(1.0, ⇒34 page)

Goal〉 To understand the outline of structural behavior in strong wind and wind resistant design in civil engineering

Schedule〉

1. Introduction
2. Occurrence mechanism of Local strong wind
3. Effect of geographic and topographic factors on Local Strong wind
4. Characteristics of fluctuating wind velocity
5. Steady aerodynamic forces exerted on thin and bluff bodies
6. Unsteady aerodynamic forces exerted on thin and bluff bodies
7. Aerodynamic response of structures, Part 1
8. Aerodynamic response of structures, Part 2
9. Aerodynamic response analyses of cables
10. Aerodynamic response analyses of tower-like structures
11. Aerodynamic response analyses of cable stayed bridges
12. Aerodynamic response analyses of suspension bridges
13. Effect of gusty wind on structural response
14. Wind resistant design in civil engineering
15. A state of the art and perspective

Evaluation Criteria〉 evaluated by attitude in class (50%) and reports (50%)

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124992/

Contact〉 Nagao (A515, +81-88-656-9443, fumi@ce.tokushima-u.ac.jp)

Advanced Structural Analysis

Professor · Kiyoshi Hirao, *Associate Professor* · Yoshifumi Nariyuki (2 units)

Target〉 Method of non-linear analysis of framed structures subjected to static and dynamic loads is studied.

Outline〉 Not only geometrical and material non-linear problems in structural analysis and analytical method of non-linear behavior of framed structures, but also computation of ultimate strength and stability of framed structures subjected to static load and dynamic load are discussed in portfolio.

Style〉 Portfolio

Keyword〉 Structural analysis of frames, Material non-linear, Geometrical non-linear, Ultimate strength

Requirement〉 Students are required to have a good understanding of structural mechanics.

Goal〉 To obtain the fundamental knowledge of non-linear analytical method of plane framed structures.

Schedule〉

1. Guidance and purpose of this subject
2. Outline of analytical method of framed structures
3. Geometrical non-linear problems 1
4. Geometrical non-linear problems 2
5. Geometrical non-linear problems 3 / Report 1
6. Material non-linear problems 1
7. Material non-linear problems 2
8. Material non-linear problems 3
9. Material non-linear problems 4
10. Material non-linear problems 5 / Report 2
11. Combined non-linear problems 1
12. Combined non-linear problems 2
13. Combined non-linear problems 3
14. Combined non-linear problems 4 / Report 3
15. Discussion on assignments

Evaluation Criteria〉 Assignments count 100%

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124993/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Nariyuki (A510, +81-88-656-7326, nariyuki@ce.tokushima-u.ac.jp)
⇒ Hirao (A511, +81-88-656-7324, cvsteng@ce.tokushima-u.ac.jp)

Earthquake Resistant Design

Professor · Tsutomu Sawada (2 units)

Target〉 To acquire the method for resolving problems in earthquake resistant design of structures.

Outline〉 Some topics in earthuake resistant design of structures, such as, engineering characteristics of ground motions, simulation of earthquake ground motions, response analysis of structures, dynamic interaction between ground and foundation, are selected and discussed in portfolio.

Style〉 Portfolio

Keyword〉 earthquake resistant design, earthquake ground motions, simulation of earthquake ground motions

Relational Lecture〉 "Advanced Structural Analysis"(0.5, ⇒307 page)

Requirement〉 Non

Notice〉 Non

Goal〉 To acquire the method for resolving problems in earthquake resisting design of civil engineering structures.

Schedule〉

1. To search topics in earthquake resistant design of civil engineering structures(1-3).
2. To investigate some themes out of the topics by references(4-12).
3. To prepare and submit the reports on the themes(13-15).

Evaluation Criteria〉 Evaluate 100% by report.

Textbook〉 To be introduced in the class.

Reference〉 Proceedings of World Conference on Earthquake Engineering

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124994/

Student〉 Able to be taken by only specified class(es)

Contact〉 Sawada (A307, +81-88-656-9132, sawada@ce.tokushima-u.ac.jp)

Advanced Materials for Civil Works

Professor · Hiroyuki Mizuguchi, *Associate Professor* · Takao Ueda (2 units)

Target〉 Acquirement of recent technique on concrete enginering paticularly new concrete such as high performance concrete ,eco-concrete, etc., and maintenace engineering in civil works, in the view point of sustainable material cycling society.

Outline〉 Characteristics and performance of important materials used for civil works to construction infrastructure facilities and to manage environment. A concept of environment conscious materials and environmentally friendly concrete. Characteristics and designing method of environmentally mitigative concrete and organism adaptable concrete, such as porous concrete including many continuous voids and big holes, used for concrete structures and environmentally friendly materials to realize sustainable deveropment.

Style〉 Lecture in combination with Portfolio

Keyword〉 Sustainable Society, Material Cycing Society, Materials for Civil Works

Relational Lecture〉 "Flow Mechanism and Control for Fresh Concrete"(0.5, ⇒310 page)

Requirement〉 No requiremaent.

Notice〉 This class is consituted of some lectures, some reporting for subjects and presentation and discussion class on the reports

Goal〉

1. Understanding on a concept of sustainable material cycling society in civil works.
2. Understanding on materials having low environmental impact in civil works.

Schedule〉

1. Guidance
2. Definition of eco-concrete
3. Properties of porous concrete(1)
4. Properties of porous concrete(2)
5. Proportioning method of porous concrete
6. Application example of porous concrete
7. Properties of recycled aggregate concrete(1)
8. Properties of recycled aggregate concrete(2)
9. Landscape of concrete structures
10. Properties of concrete admixing fly ash (1)
11. Properties of concrete admixing fly ash (2)
12. Properties of concrete admixing blast furnace slag
13. Durability of concrete admixing industrial by-products
14. Durability design and life cycle design (1)
15. Durability design and life cycle design (2)

Evaluation Criteria〉 Estimation using presentation and reports.

Textbook〉 Using photo copying materials, etc.

Webpage〉 http://www.ce.tokushima-u.ac.jp/ksys/mizuguchi/

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124995/

Student〉 Able to be taken by student of other department and faculty

Contact〉

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

⇒ Ueda (A502, +81-88-656-2153, ueda@ce.tokushima-u.ac.jp)

Flow Mechanism and Control for Fresh Concrete

Professor · Chikanori Hashimoto (2 units)

Target〉 The objective of this subject is to understand the recent techonology on consistency of fresh concrete in process of mixing or flowing in the construction machine, such as concrere mixer, concrete pump or concrere agitator.

Outline〉 Mechanical behavior of concrete materials in process of mixing, conveying and compacting using the visualization technique of fresh concrete. Application of the rheology to fresh concrete. Design of self-compacting concrete and eco-concrete. Concept for construction design, which is the performance-based design. Basic concept for new types of structure such as partially prestressed concrete structures.

Style〉 Lecture in combination with Portfolio

Keyword〉 Visualizaion technique of fresh concrete, Application of visualized analysis on fresh concrete, Deformed pipe, Agitator drum, Diaphragm wall, Consistency test, Bi-axial forced mixing type mixer, Vertical continuous mixer with gravity

Requirement〉 It is necessary for students to learn the basic attainments on the concrete engineering.

Goal〉

1. The porpose is to understnad the visualization technique of fresh concrete.
2. The porpose is to understnad the application of flow analysis in process of mixing or flowing in the construction machine.

Schedule〉

1. Guidance
2. Visualizaion technique of fresh concrete (historical development).
3. Visualizaion technique of fresh concrete (materials used).
4. Visualizaion technique of fresh concrete (method of image analysis).
5. Visualizaion technique of fresh concrete (scale effect of model concrete).
6. Visualizaion technique of fresh concrete (ploblem to be solved).
7. Application of visualized analysis on fresh concrete flowing through the tapered pipe.
8. Application of visualized analysis on fresh concrete flowing through the bend pipe or bifurcated pipe.
9. Application of visualized analysis on fresh concrete discharging of agitator drum..
10. Application of visualized analysis on fresh concrete mixing in agitator drum.
11. Application of visualized analysis on fresh concrete placing for diaphragm wall.
12. Application of visualized analysis on fresh concrete flowing in the vessel of consistency test.
13. Application of visualized analysis on self-compacting concrete casting in the slab form.
14. Application of visualized analysis on fresh concrete in process of mixing in bi-axial forced mixing type mixer.
15. Application of visualized analysis on fresh concrete in process of mixing in vertical continuous mixer with gravity.
16. Preliminary

Evaluation Criteria〉 Evaluate by reports or presentations or each subject.

Textbook〉 Handout of phot copying materials for each subject.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124996/

Advance Lecture of Political Simulation

Professor · Akio Kondo, *Associate Professor* · Yoshinobu Hirose (2 units)

Target〉 The technique of modelling of regional and environmental systems, and the concept and application method of prediction and evaluation models to political simulation are studied.

Outline〉 Not only the technique of modelling, but also the application method of prediction and evaluation models to political simulation is discussed in portfolio.

Style〉 Portfolio

Keyword〉 Political Simulation, Technique of Modelling, Prediction and Evaluation

Requirement〉 特になし

Notice〉 特になし

Goal〉 To obtain the knowledge of the technique of modelling and application method of prediction and evaluation models, apply them to political simulation.

Schedule〉

1. Guidance and purpose of this subject
2. Systems of political simulation
3. Technique of modelling 1
4. Technique of modelling 2
5. Application of model : Prediction 1
6. Application of model : Prediction 2
7. Application of model : Evaluation of policy 1
8. Application of model : Evaluation of policy 2
9. Example of political simulation : Population policy
10. Example of political simulation : Urban transport policy
11. Example of political simulation : Landuse policy
12. Example of political simulation : Social policy
13. Example of political simulation : Environment policy
14. The technique of political simulation in the future
15. Regional policies in the 21st Century

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/kondo/top/index.htm

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124997/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Note〉 特になし

Advanced Lecture in Social Risk Engineering

Professor · Hitoshi Murakami, *Associate Professor* · Yasunori Kozuki (2 units)

Target〉 To understand concept of risk, to cultivate ability of measures how to reduce , avoid, compensate for various risiks. the reducing, the evading of the risk, the compensation for it.

Outline〉 Technique of risk assessment and its comunication for various social risiks on risk manegement is lecterd.

Style〉 Lecture in combination with Portfolio

Keyword〉 Social Risks, Risk Management, Crisis Management

Goal〉 To obtain the knowledge of risk management and application method of various social risks.

Schedule〉

1. Guidance and purpose of this subject
2. Sources of various social risks
3. Evaluation of social risk(1)
4. Evaluation of social risk(2)
5. Risk manegement (1.risik perception)
6. Risk manegement(2.risik communication)
7. Risk manegement(3.evaluation standard)
8. Example of risik manegement(1.evacuation for natural disaster)
9. Example of risik manegement(2.evacuation for natural disaster)
10. Example of risik manegement(3.evacuation for natural disaster)
11. Example of risik manegement(4.avoidance of risik and insurerance)
12. Presentaion and discusion for social risk(1)
13. Presentaion and discusion for social risk(2)
14. Presentaion and discusion for social risk(3)
15. Summary

Evaluation Criteria〉 Assignments Count 100%

Textbook〉 To be introduced in the class

Reference〉 リスク学辞典

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124998/

Student〉 To be limited to the students of the course

Contact〉 Murakami (Eco504, +81-88-656-7334, murakami@eco.tokushima-u.ac.jp)Monday 16:20-17:50

Advanced mitigation engineering

Professor · Hideki Ueshima (2 units)

Target〉 To obtain the abilities to find and solve environmental problems using for application of mitigation technique

Outline〉 To surveying of the latest news of mitigation and to understand its concept and examine the technique to mitigate the deterioration environment

Style〉 Lecture in combination with Portfolio

Keyword〉 District Improvement Plan for Disaster Mitigation, coastal environment

Fundamental Lecture〉 "Advanced Lecture in Social Risk Engineering"(1.0, ⇒404 page), "Advance Lecture of Political Simulation"(1.0, ⇒403 page)

Goal〉 To design and assess the mitigation plan for deterioration coastal environment

Schedule〉

1. Guidance of this subject
2. Current topics about mitigation 1
3. Current topics about mitigation 2
4. Current topics about mitigation 3
5. Current topics about mitigation 4
6. Current topics about mitigation 5
7. Current topics about mitigation 6
8. Current topics about mitigation 7
9. Current topics about mitigation 8
10. Current topics about mitigation 9
11. Current topics about mitigation 10
12. Discussion on research theme1
13. Discussion on research theme2
14. Discussion on research theme3
15. Presentation

Evaluation Criteria〉 Assignments count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124999/

Contact〉 Ueshima (National Institute of Advanced Industrial Science and Technology, +81-823-72-1901, h-ueshima@aist.go.jp)

Advanced Exercise on Civil and Environmental Engineering

Teacher of course (2 units)

Target〉 This subject is especially provided in order to deepen the study, and must be taken under the guidance of a faculty in major field of study.

Outline〉 Exercises related to research theme are performed.

Style〉 Portfolio

Keyword〉 Exercise, Civil and Environmental Engineering

Goal〉 To obtain deeper knowledge regarding research theme.

Schedule〉

1. Guidance
2. Exercise
3. Report

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125000/

Student〉 Able to be taken by only specified class(es)

Contact〉 Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Advanced Research on Civil and Environmental Engineering

Teachers in other colleges or departments (2 units)

Target〉 To obtain broad information on recent engineering

Outline〉 To research a theme in a technology, which is different form the main technology in your field.

Style〉 Portfolio, Lecture in combination with Portfolio, Lecture and excercise

Keyword〉 Engineering, Technology, Different field

Requirement〉 N/A

Notice〉 N/A

Goal〉 To learn a recent technology, which is different from the main technology in your field.

Schedule〉

1. Choose a theme on technology or engineering, which is different from that in your field.

Evaluation Criteria〉 Evaluated with portfolio or examination

Textbook〉 Ask to teachers.

Reference〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125001/

Student〉 Able to be taken by only specified class(es)

Intelligent Structures and Mechanics Systems Engineering — Civil and Environmental Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Human Factors ..... WEB page, CMS
  - Life Science ..... WEB page, CMS
  - Social Science ..... WEB page, CMS
  - Science and Technology Studies ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Presentation Method (D) ..... WEB page, CMS
  - Internship (D) ..... WEB page, CMS
  - Venture Business (D) ..... WEB page, CMS
- *Specialized Subjects*
  - Engineering of Correlated Electron Matter ..... WEB page, CMS
  - Quantum Theory of Materials ..... WEB page, CMS
  - Simulation Aided Mathematical Sciences ..... WEB page, CMS
  - Nonlinear Analysis ..... WEB page, CMS
  - Watershed Hydrologic Engineering ..... WEB page, CMS
  - Ecological Hydroengineering ..... WEB page, CMS
  - Geoenvironmental Design Theory ..... WEB page, CMS
  - Geoenvironment Control Engineering ..... WEB page, CMS
  - Urban System Analysis ..... WEB page, CMS
  - Wind Engineering ..... WEB page, CMS
  - Advanced Structural Analysis ..... WEB page, CMS
  - Earthquake Resistant Design ..... WEB page, CMS
  - Advanced Materials for Civil Works ..... WEB page, CMS
  - Flow Mechanism and Control for Fresh Concrete ..... WEB page, CMS
  - Advance Lecture of Political Simulation ..... WEB page, CMS
  - Advanced Lecture in Social Risk Engineering ..... WEB page, CMS
  - Advanced mitigation engineering ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Exercise on Civil and Environmental Engineering ..... WEB page, CMS
  - Advanced Research on Civil and Environmental Engineering ..... WEB page, CMS

Intelligent Structures and Mechanics Systems Engineering — Mechanical Engineering
Syllabus of subjects

List of Subjects

Human Factors

Part-time Lecturer · Atsuya Yoshida (2 units)

Target〉 The objective of this class is to provide students with sufficiently thorough appreciation of the many facets of the human factors discipline so that they may make use of it to their own doctoral works.

Outline〉 This class offers a broad and comprehensive overview of the human factors/ergonomics discipline with four areas of emphasis, (1) historical review of human factors research, (2) human physical, perceptual and cognitive capabilities and limitations, (3) application of human factors research data in design, especially in the interface design of computer-based systems, and (4) discussion about the relationship between the designed system (technology) and people.

Schedule〉

1. What is Human Factors
2. Historical Overview of Human Factors
3. Multi-Disciplinary Aspect of Human Factors
4. Health and Safty Issue of Human Factors
5. Human Psychological Capability
6. Task Analysis
7. Human Error
8. Universal Design
9. Cognitive Artifact
10. Visibility and Affordance
11. Human-Computer Interaction
12. Human Information Processing
13. Knowledge and Mental Model
14. Usability Paradigms and Principles
15. Evaluation and Testing
16. Making system that makes us smart

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124976/

Life Science

Part-time Lecturer · Hiroshi Takagi, *Professor* · Akihiko Tsuji (2 units)

Target〉 Understanding of significance of protein in biotechnology

Outline〉 Basics of structure, function and application of protein are introduced

Style〉 Lecture

Keyword〉 Protein, Enzyme, Biotechnology

Goal〉

1. Understanding of multiple functions of proteins
2. Understanding of principle of protein engineering and its application

Schedule〉

1. Introduction of life science
2. History of life science
3. Structure and function of DNA and RNA
4. mRNA is a template of protein
5. Duplication of DNA
6. Regulation of protein expression
7. Human Genetics
8. Genetic disease
9. DNA diagnosis
10. Structure and function of protein
11. Principle of gene technology (1)
12. Principle of gene technology (2)
13. Protein engineering
14. Future of life science (1)
15. Future of life science (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124977/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Social Science

Part-time Lecturer · (2 units)

Target〉 The mutual relationship of economic activities, the structure and function of economic society, and the concept and technique of mathematical programming modelling are lectured.

Outline〉 Not only the mutual relationship of economic activities is explained from domestic and international points of view, but also the technique of case studies by application of mathematical programming models is tought using the various kinds of materials and examples.

Keyword〉 Economic activities, Structure and function, Mathematical programming model

Goal〉 To understand the mutual relationship of economic activities, empirically explain them using the mathematical programming model and evaluate the model.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of economic activities 1
3. Examples of economic activities 2
4. Examples of economic activities 3
5. Change in structure of economic society 1
6. Change in structure of economic society 2
7. Function of economic society 1
8. Function of economic society 2
9. Mutual relationship of economic activities 1
10. Mutual relationship of economic activities 2
11. Concept of mathematical programming model
12. Technique of model construction
13. Modelling of economic activities 1
14. Modelling of economic activities 2
15. Evaluation of modelling

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124978/

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Science and Technology Studies

Part-time Lecturer · (2 units)

Target〉 Let to learn the minimum essentials of science and technology studies and its function in contemporary society.

Outline〉 The science and technology studies deal with science and technology research and its outcomes by means of various methods of social science and humanities. The discipline emerged in 1930s when social importance of science and technology became evident. Since 1970s, the science and technology studies have developed as mission oriented learning for government policy, buisiness administrations and civic activity. students are expected to learn the outline of this discipline : the philosophy of science, history of science and technology, and sociology of science and technology, as well as their application to the problems in contemporary society since 1970s.

Style〉 Lecture

Goal〉

1. Understanding of the minimum essentials of the science and technology
2. Understanding of the social meaning of each student's research

Schedule〉

1. Introduction: A brief history of the science and technology studies since 1930s
2. Philosophical understanding of science: (1) Greek classics and scholastic study
3. Philosophical understanding of science: (2) Science study in Enlightenment and German Classics
4. Philosophical understanding of science: (3) Rise of the philosophy of science in the early twentieth century
5. Historical investigation of science and technology : (1) Emergence of the modern science
6. Historical investigation of science and technology : (2) technology in the Medieval West and the non -Western World
7. Historical investigation of science and technology : (3) Significance of the Industrial Revolution
8. Sociology of science and technology: (1) Normative structure and Paradigm
9. Sociology of science and technology: (2) Social constructivism and Laboratory life analysis
10. The 1950s model of science and technology policy in the Cold War
11. Innovation and Science and Technology
12. Knowledge industrial society since 1970s: (1) Environmental problem and energy prpblem
13. Knowledge industrial society since 1970s: (2) Computer science and Information society
14. Science and technology in the global economy since 1990s
15. Concluding remark: Science and technology in the future

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124979/

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124980/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124981/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)
⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Presentation Method (D)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124982/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (D)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal. (2)
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124983/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (D)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124984/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Quantum Theory of Materials

Associate Professor · Yoshitaka Michihiro (2 units)

Target〉 This class introduces the advanced quantum mechanics and quantum field theory.

Outline〉 Basics of advanced quantum mechanics and quantum field theory are introduced.

Style〉 Lecture

Goal〉 To understand the outline of advanced quantum mechanics and quantum field theory.

Schedule〉

1. Introduction
2. Quantum mechanics (1)
3. Quantum mechanics (2)
4. Hartree-Fock approximation
5. Koopman's theorem
6. Density functional theory
7. Kohn-Sham equation
8. Local density approximation
9. Perturbation (1)
10. Perturbation (2)
11. Quantum field theory
12. Creation operator and annihilation operator
13. Field quantization
14. Phonon
15. Electron gas

Evaluation Criteria〉 Assignments count 100%.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127917/

Contact〉 Yoshitaka Michihiro (A203)

Radio Frequency Solid State Physics

Professor · Takashi Ohno, *Assistant Professor* · Koichi Nakamura (2 units)

Target〉 This class introduces basis of NMR and applications to studies on superconductivity, magnetism and ionic diffusion in solid.

Outline〉 The spectrum, spin-lattice relaxation, spin-spin relaxation, chemical shift etc., which are obtained by NMR measurements, are introduced and discussed in connection with various physical properties of solids.

Keyword〉 Nuclear Magnetic Resonance, Superconductivity, Magnetism, Diffusion

Goal〉

1. To understand basis of NMR.
2. To understand relationship between various problems in solid state physics and relaxation phenomena observed using NMR.

Schedule〉

1. Introduction
2. Spin-echo and NMR spectrum
3. Equipments
4. Dipole interaction
5. Hyperfine interaction and spectrum
6. Chemical shift
7. Quadrupole interaction and quadrupole resonance
8. Spin-lattice relaxation
9. Internal magnetic field in ferro and antiferro magnets
10. Spin-lattice relaxation in metals
11. NMR studies on superconducting state
12. NMR studies on High Tc superconductors
13. Diffusion in solid and spin-lattice relaxation
14. NMR studies on lithium ionic conductors
15. NMR studies on protonic conductors
16. Summary

Evaluation Criteria〉 Report100%

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/127918/

Contact〉

⇒ Ohno (A201, +81-88-656-7549, ohno@pm.tokushima-u.ac.jp)
⇒ Nakamura (A216, +81-88-656-7577, koichi@pm.tokushima-u.ac.jp)

Controlling Physical Properties of Crystalline Materials

Associate Professor · Tatsuya Okada (2 units)

Target〉 Geometrical theories of grain boundary character in polycrystalline materials are described. Various methods to describe textures are also introduced.

Outline〉 Various geometric theories of grain boundaries and textures are introduced.

Style〉 Portfolio

Keyword〉 grain boundary, geometrical theory, texture

Fundamental Lecture〉 "Material Applications"(1.0, ⇒330 page)

Goal〉

1. CSL theory of geometrical character of grain boundaries must be understood.
2. Various methods to describe textures must be understood.

Schedule〉

1. Dislocation theory of small angle grain boundaries
2. Dislocation theory of general boundaries
3. Extension of geometrical theory to interphase interfaces
4. O-lattice theory
5. CSL theory
6. Calculation of grain boundary dislocations
7. Miller indices and stereographic projection
8. Pole figure and inverse pole figure
9. Euler angles to describe crystallographic orientation
10. Orientation distribution function
11. Experimental analysis of textures
12. Deformed textures
13. Recrystallized textures
14. Textures and physical properties 1
15. Textures and physical properties 2

Evaluation Criteria〉 Evaluation is based on term papers.

Reference〉

- ◇ Forwood and Clarebrough: Electron Microscopy of Interfaces in Metals and Alloys (Adam Hilger)
- ◇ Randle: Microstructure Determination and its Applications (The Institute of Materials)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125003/

Contact〉 Okada (M616, +81-88-656-7362, t-okada@me.tokushima-u.ac.jp)

Material Applications

Professor · Kenichi Yoshida, *Associate Professor* · Hideo Nishino, Hitoshi Takagi (2 units)

Target〉 This class acquires importance of the material evaluation using acoustic emission method and guided wave method that are prospective as advanced material evaluation methods in more serious environment. Also it acquires the development and the prospective trend since now of the green composite materials with natural fibers and biodegradated resin as one of the advanced composites.

Outline〉 Non-destructive methods are more important in the material evaluation methods that have been performed widely since then. This class introduces the measuring fundamentals and the analysis using the acoustic emission method and guided wave detecting method, and also the characteristics and the up-to-date development trend of green composites with less environmental burden.

Style〉 Lecture

Keyword〉 acoustic emisson(AE), guided wave analysis, green composite

Fundamental Lecture〉 "Material Engineering"(0.2, ⇒64 page), "Physical properties of materials"(0.2, ⇒56 page)

Requirement〉 Students are required to have a good undertanding of fundamental knowledge of materials engineering.

Goal〉

1. To make clear the deformation and fracture dynamics of advanced materials by analysis of obtained AE signals.
2. To identify verious types of defects and search for a plant life prediction using the guided wave propagating through materials.
3. To understand the high-performed and high-qualified green composite as one of the advanced materials with less environmental burden.

Schedule〉

1. Introduction of AE method
2. AE source characterization
3. AE behavior during deformation in advanced materials and its deformation mechanism
4. AE behavior due to microcracking in advanced materials and its fracture prediction technology
5. Up-to-date trend of material evaluation technology with AE method
6. Propagation theory of ultrasonics in materials with viscoelasticity, anisotropy, piezoelectricity and non-linearity
7. Propagation simulation of ultrsonics
8. Fundamentals of guided wave with SH mode plate wave
9. Guided wave to circumferencial and axial directions
10. Up-to-date research trend of guided wave
11. Concept of advanced composite materials
12. Classification of advanced composite materials and its application
13. Characteristics of advanced composite materials
14. Advanced composite materials and global environment
15. Development trend of green composite

Evaluation Criteria〉 Assignments count 100%

Textbook〉 Not used

Reference〉 Will be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125004/

Student〉 Able to be taken by only specified class(es)

Contact〉 Yoshida (M619, +81-88-656-7358, yoshida@me.tokushima-u.ac.jp)Thursday and Friday, 17:00 to 18:00

Material and Computational Mechanics

Professor · Katsutoshi Yamada, *Assistant Professor* · Atsuya Oishi, Takuo Nagamachi (2 units)

Target〉 To understand both theory and computing system for computational mechanics of solving physical phinomina for natural and artificial objects

Outline〉 From theoretical aspects deformation theory of solids, FEM and numerical methods are discussed. From aspects of computing system, algorism and high performace procedure are given of large scale computing system for designs and working of material, machine and structures, and controls.

Style〉 Lecture

Keyword〉 Nonlinear probloem of solid mechanics, Large scale system of computational mechanics

Goal〉

1. To understand mathematical theory and physics for nonlinear problems for solid
2. To construct large scale computing system and to simulate using them and understand of their results.

Schedule〉

1. Tensor analysis
2. Weighted residual mathod and variational principles
3. Non-linear mataerial problems
4. Geomytrically non-linear problems
5. Time depending problems
6. Application to non-structual problems
7. Envirament for parallel processing
8. Algorism for parallel processing FEM analysis
9. Implementation of parallel processing FEM analysis
10. Basic theory of soft computing
11. Soft omputing for CAE
12. Implicit method for statics
13. Explicit method for dynamics
14. Constitutive equations for non-iron-metals
15. Method of high speed computing
16. Recent h igh pricision method of FEM simulations

Evaluation Criteria〉 Assignments count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125005/

Contact〉

⇒ Yamada (M621, +81-88-656-7364, yamada@me.tokushima-u.ac.jp)Friday 17:00-18:00
⇒ Oishi (M622, +81-88-656-7365, oishi@me.tokushima-u.ac.jp)
⇒ Nagamachi (M524, +81-88-656-9187, ngmch@me.tokushima-u.ac.jp)

Fluid Energy Control

Professor · Junichiro Fukutomi (2 units)

Target〉 This class introduces hydrodynamic characteristics of turbomachinery, behavior of internal flow and problems with it.

Outline〉 Advanced concepts of fluid energy control and energy conversion. Performance characteristics, internal flow conditions and anomalous phenomena in fluid machinery. Performance improvement and noise reduction of turbo-machinery by flow control. Utilization of renewable fluid sources such as hydro-dams, wind, wave and tides.

Keyword〉 Energy conversion, Turbomachinery, Internal flow

Fundamental Lecture〉 "Fluids Energy Conversion Engineering"(1.0, ⇒65 page)

Goal〉 To understand hydrodynamic characteristics of turbomachinery, behavior of internal flow and problems with it.

Schedule〉

1. Theory of centrifugal turbomachinery 1
2. Theory of centrifugal turbomachinery 2
3. Theory of axial turbomachinery 1
4. Theory of axial turbomachinery
5. Quasi three-deimensional flow analysis of turbomachinery
6. Turbulence modeling and numerical flow simulation 1
7. Turbulence modeling and numerical flow simulation 2
8. Mid-term test
9. Characteristics of turbocharger for automobile
10. Noise of turbomachinery 1
11. Noise of turbomachinery 2
12. Anomous phenomena of turbomachinery 1 (cavitation, water hammer)
13. Anomous phenomena of turbomachinery 2 (surging, rotating stall)
14. Application technology of natural flow energy 1 (wind turbine)
15. Application technology of natural flow energy 1 (small hydro turbine)
16. Term test

Evaluation Criteria〉 As mid-term test of 50 points and term test of 50 points, it is made to be passing over sum total of 60 points.

Textbook〉 Not used

Reference〉 Will be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125006/

Contact〉 Fukutomi (M519, +81-88-656-7367, fukutomi@me.tokushima-u.ac.jp)

Thermal Energy Control

Professor · Itsuki Morioka, *Associate Professor* · Masanori Kiyota (2 units)

Target〉 Aiming at the permanent use of resources and energy, basic principles of thermal energy, heat transmission, and characteristics of energy control devices and working fluid are discussed. Various usages of thermal energy flow are analyzed with exergy method.

Outline〉 Principle and characteristic about thermal energy, the control system, practical method and efficiency evaluation of thermal energy control. Energy flow analysis with heat, physical and chemical exergy.

Keyword〉 thermal energy, energy conversion

Goal〉 To use thermal energy effectively and to apply to environmental problems

Schedule〉

1. Basics and characteristic of thermal energy 1
2. Basics and characteristic of thermal energy 2
3. Basics and characteristic of thermal energy 3, report problem
4. Characteristic of thermal energy control 1
5. Characteristic of thermal energy control 2
6. Characteristic of thermal energy control 3, report problem
7. Control elements of thermal energy 1
8. Control elements of thermal energy 2
9. Control elements of thermal energy 3, report problem
10. Control units of thermal energy 1
11. Control units of thermal energy 2
12. Control units of thermal energy 3, report problem
13. Evaluation of thermal energy control 1
14. Evaluation of thermal energy control 2
15. Evaluation of thermal energy control 3, report problem
16. Final test, oral examination

Evaluation Criteria〉 Scores of reports and final oral examination are used

Textbook〉 To be introdued in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125007/

Student〉 Course students only

Contact〉

⇒ Morioka (M521, +81-88-656-7373, morioka@me.tokushima-u.ac.jp)
⇒ Kiyota (M522, +81-88-656-7374, kiyota@me.tokushima-u.ac.jp)

Multiphase Fluids Transport

Professor · Akiharu Ousaka (2 units)

Target〉 This class introduces a new technolgy of advanced heat transfer and fluid mechanics that can be used for determining the optimal design and operating conditions of nuclear and geothermal power plants and also chemical plant.

Outline〉 Fundamental concepts of multiphase mixtures,Modeling flow-pattern transitions, Gas-liquid two-phase flow under microgravity, Film formation in annular flow, Flooding phenomena, Two-phase flow in micro-channel

Style〉 Lecture

Keyword〉 Fundamental concepts of multiphase mixtures, Film formation in annular flow, Flooding phenomena

Relational Lecture〉 "Thermal Energy Control"(0.5, ⇒333 page), "Energy and Environment Engineering"(0.5, ⇒335 page), "Fluid Energy Control"(0.5, ⇒332 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level heat transfer engineering, thermodynamics, hydrodynamics and related subjects.

Goal〉 To understand the outline of the transport phenomena in multiphase fluids

Schedule〉

1. 1. Fundamental concepts of multiphase flow
2. 2. Flow pattern map
3. 3. Pressure drop, Void fraction
4. 4. Bubble flow
5. 5. Slug flow, Froth flow
6. 6. Annular flow, Mist flow
7. 7. Film formation in annular flow(No.1)
8. 8. Film formation in annular flow(No.2)
9. 9. Gas-liquid two-phase flow under microgravity(No.1)
10. 10. Gas-liquid two-phase flow under microgravity(No.2)
11. 11. Flooding phenomena(No.1)
12. 12. Flooding phenomena(No.2)
13. 13. Flooding phenomena(No.3)
14. 14. Two-phase flow in micro-channel(No.1)
15. 15. Two-phase flow in micro-channel(No.2)
16. 16. Discussion on multiphase fluids transport

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125008/

Student〉 Able to be taken by only specified class(es)

Contact〉 Ousaka (M523, +81-88-656-7375, ousaka@me.tokushima-u.ac.jp)

Energy and Environment Engineering

Professor · Kunihiko Ishihara, *Assistant Professor* · Masashi Ichimiya (2 units)

Target〉 Aeroacoustic represented to high speed Shinkansen is complex in its generation mechanism and is stil in investigation. This class aims to understand the theory of the generation mechanism and turbulence phenomenon underlying it.

Outline〉 Latest energy and environment problems in Japan and the world. Alternative energy sources for fossil fuels which are origins of green house effects. Fluid energy transfer machines. Systems of nuclear and sustainable energy machine. Harmony of energy consumption and environment problem. Aerodynamic response of sound and vibration, and turbulent properties of fluid machines. Lecture in combination with Portfolio.(2unit)

Style〉 Lecture in combination with Portfolio

Keyword〉 Aeroacoustic, Flow induced vibration, viscoud fluid, turbulence

Fundamental Lecture〉 "Fluid Dynamics"(1.0), "Fluid Energy Conversion Engineering"(1.0)

Requirement〉 Students are required to have a good undertanding of fundamental knowledge of fluid mechanics.

Goal〉 This class aims to train researchers for universities and companies

Schedule〉

1. Outline of aeroacoustic
2. What is a vortex sound?
3. Basic equations of fluid dynamics and acoustics
4. Green function for free space
5. Phisical meanings of monopole,dipole and quadrapole
6. Lighthill's equation and Curle's equation
7. Radiation sound from compact body
8. Intermediate test
9. Viscous fluid and boundary layer
10. Laminar flow, turbulent flow and transition
11. Description of turbulence
12. Fundamental equations for turbulence
13. Wall turbulence
14. Free turbulence
15. Homogeneous and isotropic turbulence
16. Final examination

Evaluation Criteria〉 Attitude for attending class (30%) and two examinations (70%) are evaluated.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125009/

Contact〉

⇒ Ishihara (M518, +81-88-656-7366, ishihara@me.tokushima-u.ac.jp)
⇒ Ichimiya (M520, +81-88-656-7368, ichimiya@me.tokushima-u.ac.jp)

Mechanical Systems Design

Associate Professor · Junichi Hino (2 units)

Target〉 The appiled technologies of modeling, simulation, control and design methods for mechnical systems are made to master.

Outline〉 In mechanical systems, modelling and simulation by using modal analysis, semi-active and active vibration controls of mechanical systems, optimum design of active mass dampers for mechanical systems, intelligent vibration controls of mechanical systems, semi-active and active vehicle suspensions by modern control theory, and semi-active and active vehicle suspensions by intelligent methods are lectured.

Style〉 Lecture

Keyword〉 Modal Analysis, Vibration Control

Requirement〉 Students are required to have a good understanding of basic applied dynamics and vibratoin control

Goal〉

1. To understand knowledge of dynamic design method of mechanical systems
2. To advance applied technologies for dynamic design method

Schedule〉

1. Modeling and simulation by modal analysis method 1
2. Modeling and simulation by modal analysis method 2
3. Modeling and simulation by modal analysis method 3
4. Modeling and simulation by modal analysis method 4
5. Active and semi-active vibration control method 1
6. Active and semi-active vibration control method 2
7. Active and semi-active vibration control method 3
8. Vibration control by active mass damper 1
9. Vibration control by active mass damper 2
10. Vibration control by intelligent control methods 1
11. Vibration control by intelligent control methods 2
12. Design of active suspension of vehicles by modern control theory 1
13. Design of active suspension of vehicles by modern control theory 2
14. Design of active and semi-active suspension of vehicles by intelligent control theory 1
15. Design of active and semi-active suspension of vehicles by intelligent control theory 2

Evaluation Criteria〉 Assignments count 100%

Textbook〉 Printed synopses are used

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125010/

Student〉 工学研究科博士課程 1，2，3 年次

Contact〉

⇒ Yoshimura (M421, +81-88-656-7382, yosimura@me.tokushima-u.ac.jp)
⇒ Hino (M422, +81-88-656-7384, hino@me.tokushima-u.ac.jp)

Instrument and Control Engineering

Associate Professor · Kyoji Hashimoto (2 units)

Target〉 This class introduces the research results using control strategies, the application to the industrial plant of control technology.

Outline〉 Computer application to factory automation, control of industrial robot, digital process control, dynamic modeling of industrial chemical plant with neural network, dynamics of pneumatic actuators, two degree of freedom control and control of pneumatic actuators using intelligence strategies are lectured.

Style〉 Lecture

Keyword〉 Dynamic modeling, Intelligent control

Relational Lecture〉 "Mechanical Systems Design"(0.5, ⇒336 page), "Design of Dynamic Systems"(0.5, ⇒338 page)

Requirement〉 Students are required to have a good understanding of graduate-level control engineering and related subjects.

Goal〉 To understand the application to industrial plant of digital control theory,the intelligent control using actuators.

Schedule〉

1. Outline of digital control theory
2. Outline of two-degree-of-freedom control method
3. Design of two-degree-of-freedom control system
4. Model predictive control
5. Application to chemical plant control of model predictive control
6. Auto tuning PID control of chemical plant(1)
7. Auto tuning PID control of chemical plant(2)
8. Application of generalized predictive control
9. The structure and function of actuators
10. Digital control and servo mechanism
11. Recent topics of intelligent control
12. Outline of neural network
13. Neural network compensator
14. Intelligent control using actuators
15. Application to plant of control theory(1)
16. Application to plant of control theory(2)

Evaluation Criteria〉 Assignments count 100 %

Textbook〉 Printed synopses are used.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125011/

Contact〉 Hashimoto (M420, +81-88-656-7387, hasimoto@me.tokushima-u.ac.jp)

Design of Dynamic Systems

Professor · Katsunobu Konishi (2 units)

Target〉 This class introduces automatic control and image recognition techniques that can be used for autonomous control of mechanical systems.

Outline〉 Modeling and control for mechanical systems such as actuators, robotic manipulators and aerial vehicles are introduced in the first half of this class. In the second half, image processing and image recognition techniques are introduced in order to obtain environmental information necessary for autonomous control behaviour.

Fundamental Lecture〉 "Actuator Control Theory"(1.0, ⇒71 page), "System Design"(1.0, ⇒68 page), "Image Processing"(1.0)

Relational Lecture〉 "Visual pattern processing"(0.5, ⇒343 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level automatic control theory and image processing.

Goal〉

1. To understand the procedures and tools of control system design.
2. To understand the feature space analysis and object detection techniques.

Schedule〉

1. Actuator
2. Sensor
3. Equation of motion (robot arm)
4. Equation of motion (aerial vehicle)
5. Modal analysis
6. Reduced order model
7. Vibration control
8. Trajectory control
9. Intermediate examination
10. Image processing (color space)
11. Image processing (filtering)
12. Image processing (bird view observation)
13. Brightness pattern analysis
14. Feature space analysis
15. Object detection
16. Final examination

Evaluation Criteria〉 Evaluate base on two examinations and reports.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125012/

Student〉 Able to be taken by only specified class(es)

Contact〉 Konishi (M423, +81-88-656-7383, konishi@me.tokushima-u.ac.jp)

Advanced Production Technology

Professor · Yoshinari Kaieda, *Associate Professor* · Masahiro Masuda, Yoshihiro Tada (2 units)

Target〉 This class introduce powder processings and machining technologies that can be used for novel material fabrication and advanced manufacturing.

Outline〉 Forming and high-precision machining technologies for novel materials are introduced, and powder technologies for new material fabrication are also discussed.

Keyword〉 combustion synthesis, isostatic processing, tool failure, ultra-precision cutting, powder melallurgy

Requirement〉 Students are recquired to have a good understanding on fundamentals of metal processing technologies including machining and forming.

Goal〉

1. To understand advanced forming technologies including powder processings and isostatic processings.
2. To understand advanced machining technologies including tool failure, wear mechanism and precision/ultra-precision cutting.

Schedule〉

1. Introduction to powder metallurgy
2. Fundamentals of combustion synthesis
3. Applications of combustion synthesis
4. Isostatic forming technologies
5. Mid-term examination
6. Machining of novel materials
7. Tool failure and wear mechanism
8. Diamond tool
9. Presision / ultra-precision machining
10. Mid-term examination
11. Forming technologies of sintered metals
12. Consolidation of powder materials
13. Mechanical alloying
14. Porous metals and metal foams
15. Examination

Evaluation Criteria〉 Assignments count 70% and examinations count 30%.

Textbook〉 Printed synopsises are used.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125013/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Yoshinari Kaieda, room:M-321,TEL:088-656-7379, e-mail:kaieda@me.tokushima-u.ac.jp
⇒ Masahiro Masuda, room:M-320,TEL:088-656-7380, e-mail:masuda@me.tokushima-u.ac.jp
⇒ Yoshihiro Tada, room:M-319,TEL:088-656-7381, e-mail:tada@me.tokushima-u.ac.jp

Micro-Nano Engineering

Professor · Takao Hanabusa, Tetsuo Iwata (2 units)

Target〉 This class introduces mesurement techniques and instruments for analyzing and developing new materials.

Outline〉 Prof. Hanabusa lectures on the method of materials evaluation by means of X-ray diffraction: Principle of X-ray diffraction, macro and micro lattice strains, and residual stress measurement. Prof. Iwata reviews instrumental methods for extracting information on materials using optical and spectroscopic techniques: Scientific measurements, data processing, and instrumentation for chemical analysis.

Style〉 Portfolio

Keyword〉 X-ray structure analysis, scientific measurements

Relational Lecture〉 "Materials Surface Performance Control"(0.5, ⇒341 page), "Advanced Micro-Nano Engineering"(0.5, ⇒345 page), "Instrument and Control Engineering"(0.5, ⇒337 page)

Requirement〉 Students are required to have a good understanging of undergraduate-level related subjects.

Goal〉

1. To understand x-ray diffraction method and its application for material science
2. To understand scientific measurements and instrumentation technology

Schedule〉

1. Basics of X-rays
2. Lattices and crystal structures
3. Crystal axes and reciprocal lattice
4. Scattering by an atom
5. Diffraction by small crystal
6. Kinds of residual stresses
7. X-ray stress measurement
8. Instruments for scientific measurements
9. Instrumental methods for chemical analysis
10. Microscopy and near-field optics
11. Analytical instruments 1
12. Analytical instruments 2
13. Electronics for scientific measurements
14. Data-processing method for scientific measurements
15. System design for scientific measurements
16. Report and presentation

Evaluation Criteria〉 Assinments counts 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125014/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Iwata (M427, +81-88-656-9743, iwata@me.tokushima-u.ac.jp)
⇒ Hanabusa (M317, +81-88-656-7377, hanabusa@me.tokushima-u.ac.jp)

Materials Surface Performance Control

Professor · Ri-ichi Murakami (2 units)

Target〉 The nano processing of the material surface in the atomic and molecular level is carried out by the surface modification methods such as PVD or CVD. The material surface nano processing to manifest the new performance in the material surface and its evaluation is explain in this lecture. The development of the new functional materials and the precept to its application are given.

Outline〉 In this lecture, the surface micro processing which manifests new performance on the surface of material by processed under the atom or molecule level is explained, and its evaluation also is mentioned. How to be invested the transparency, electrical and electronic properties, photocatalytic mateirials and gas barrier by PVD or CVD methods is explained. Then, the effects of surface modification on the mechanical properties such as fatigue, friction-wear and corrosion of materials are discussed and then its evaluation is mentioned.

Style〉 Lecture

Keyword〉 Surface modification, PVD, CVD, Functional thin film, Surface engineering

Relational Lecture〉 "Advanced Micro-Nano Engineering"(0.5, ⇒345 page), "Controlling Physical Properties of Crystalline Materials"(0.5, ⇒329 page), "Micro-Nano Engineering"(0.5, ⇒340 page)

Requirement〉 特になし

Goal〉

1. Understanding of functional materials development
2. Understanding of evaluation of material surface performance
3. Understanding of nano processing
4. Understanding of mechanical properties of functional materials

Schedule〉

1. Function of material surface
2. Nano processing of material surface
3. Nano processing of material surface
4. Nano processing of material surface
5. Material surface modification by PVD and CVD
6. Material surface modification by PVD and CVD
7. Group discussion
8. Evaluation methods of material surface performance
9. Evaluation methods of material surface performance
10. Transparency
11. Electromagnetic wave shielding properties
12. Electric properties
13. Improvement of corrosive resistance
14. Improvement of friction and wear properties
15. Improvement of fatigue properties
16. Group discussion

Evaluation Criteria〉 Over 60% of group discussion, reports and Examination

Textbook〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125015/

Contact〉 Murakami (M318, +81-88-656-7392, murakami@me.tokushima-u.ac.jp)Monday 16:00-17:00

Intelligent Information Systems

Professor · Yoneo Yano, *Associate Professor* · Kazuhide Kanenishi, Hiroaki Ogata, Teruaki Ito (2 units)

Target〉 Learning the design methods of intelligent information systems such as educational software and interactive systems.

Outline〉 Intelligent systems and their mechanics. Intelligent CAI. Intelligent interface. Micro-worlds in intelligent CAI. Learner-teacher modelling. Knowledge acquisition models. Empirical and analytical machine learning, e. g., ID3, similarity-, explanation-, and case-based learning. Genetics-based machine learning, e. g., genetic evolution and co-evolution of production systems, finite state machines, recurrent neural networks, and strategic knowledge.

Style〉 Lecture

Keyword〉 Intelligent Interface, Intelligent Educational Systems, Intelligent Agents, CSCW, CSCL

Fundamental Lecture〉 "Human Factors"(1.0, ⇒318 page)

Relational Lecture〉 "Applied Knowledge Systems"(0.5, ⇒462 page), "Autonomous Adaptive Systems Engineering"(0.5, ⇒457 page)

Goal〉 Acuisition of the design methods of educational systems and interactive systems

Schedule〉

1. Overview of Intelligent Information Systems
2. Intelligent CAI
3. Cognitive model for Learning
4. Design of ITS(Intelligent Tutoring System)
5. ILE(Interactive Learning Environment)
6. CSCL
7. Ubiquitous and Mobile Learning Environment

Evaluation Criteria〉 We will grade based on reports and interactive presentation among students.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125016/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Yano (C511, +81-88-656-7495, yano@is.tokushima-u.ac.jp)
⇒ Kanenishi (, +81-88-656-7285, marukin@cue.tokushima-u.ac.jp)
⇒ Ogata (C507, +81-88-656-7498, ogata@is.tokushima-u.ac.jp)
⇒ Ito (M316, +81-88-656-2150, ito@me.tokushima-u.ac.jp)

Visual pattern processing

Professor · Shunichiro Oe, *Associate Professor* · Kenji Terada (2 units)

Target〉 The basic technologies which replace the visual pattern processing function of man by computer and their applied technologies are made to master.

Outline〉 The advanced processing techniques of visual pattern, i.e., the pre-processing techniques, the feature extraction techniques, the classification techniques of visual pattern, the processing techniques of color image and their application examples are lectured.

Style〉 Lecture in combination with Portfolio

Keyword〉 pattern recognition, vision, image processing

Fundamental Lecture〉 "Applied Image Processing"(1.0, ⇒239 page)

Goal〉 Acquisition of knowledge about the processing theories of visual pattern and their various applied technologies, and the processing technologies of color image

Schedule〉

1. Concept of pattern recognition
2. Statistical pattern classification method1
3. Statistical pattern classification method 2
4. Pattern classification method by the structural analysis technique
5. Pre-processing method of visual pattern
6. Feature extraction method of visual pattern 1
7. Feature extraction method of visual pattern 2
8. Segmentation method of visual pattern 1
9. Segmentation method of visual pattern 2
10. Pattern classification method by neural network
11. Pattern classification method by GA
12. Security image processing
13. Tracking of moving object
14. Texture analysis
15. The feature extraction method of color image and its application
16. Periodic examination

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125017/

Student〉 Able to be taken by only specified class(es)

Advanced conversion systems of resource energy

Professor · Kei Miwa, *Associate Professor* · Yoshiyuki Kidoguchi (2 units)

Target〉 To learn special knowledge concerning present energy resources and energy supplying systems, to understand principle and mechanism of energy conversion, and to improve thinking faculty for application of new energy and its conversion

Outline〉 To explain effective combustion technologies, reasonable utilization of energy and application of unused energy for saving consumption of fossil fuels and primary energy on the point of saving resources, energy and preserving the environment

Style〉 Portfolio

Keyword〉 Energy conversion, Energy resources, Utilization of energy, Environmental protection, Energy saving

Requirement〉 None

Notice〉 None

Goal〉 To understand fundamentals of energy conversion and to consider effective utilization of energy and improvement of energy conversion technologies

Schedule〉

1. Present state of energy resources
2. Energy and environmental problem
3. Future view of energy resources
4. Fundamentals of energy conversion (1)
5. Fundamentals of energy conversion (2)
6. Principle of energy conversion (1)
7. Principle of energy conversion (2)
8. Principle of energy conversion (3)
9. Technologies of energy conversion (1)
10. Technologies of energy conversion (2)
11. Technologies of energy conversion (3)
12. Approach to effective utilization of energy (1)
13. Approach to effective utilization of energy (2)
14. Application of new energy (1)
15. Application of new energy (2)

Evaluation Criteria〉 Appraise the understanding of the content of the lecture by setting some reports

Textbook〉 None

Reference〉 None

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/miwa/index.html

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125018/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Miwa (Eco503, +81-88-656-7370, miwa@eco.tokushima-u.ac.jp)
⇒ Kidoguchi (Eco502, +81-88-656-9633, kidog@eco.tokushima-u.ac.jp)

Note〉 Need to submit some reports

Advanced Micro-Nano Engineering

Part-time Lecturer · , (2 units)

Target〉 This class introduces micro-nano process, especially photo-induced processes

Outline〉 Essentials for the research beginners. This class contains the discussion of recent topics and operation of laser device

Requirement〉 Students are required to have a good understanding of under-graduate level physics and related subjects.

Goal〉 To obtain advanced knowledge for performing a reseach project on micro-nano engineering using a laser.

Schedule〉

1. Various micro-nano process and photo-induced process
2. Basics of laser
3. Laser devices and control
4. Photo-induced process
5. Laser devices and properties
6. Focusing optics and applications
7. Imaging optics and applications
8. Thermal process and heat conduction 1
9. Thermal process and heat conduction 2
10. Photo-chemical process
11. Micro thermal process
12. Film deposition and nano-particles
13. Ultra-fast laser processing
14. Recent topics on laser micro-nano engineering
15. Operation of a laser device
16. Report and presentation

Evaluation Criteria〉 Assignments counts 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125019/

Advanced Exercise on Mechanical Engineering

All teachers (2 units)

Target〉 To obtain comprehensive insight in the field of mechanical engieering.
Outline〉 Advanced excise on mechanical engineering.
Style〉 Portfolio, Lecture in combination with Portfolio
Keyword〉 Mechnanical Engineering, Doctor thesis
Requirement〉 N/A
Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125020/
Student〉 Able to be taken by only specified class(es)

Advanced Research on Mechanical Engineering

Teachers in other colleges or departments (2 units)

Target〉 To obtain broad information on recent engineering.

Outline〉 To research a theme in a technoligy, which is diffrent from the main technology in your field.

Style〉 Portfolio, Lecture in combination with Portfolio, Lecture and excercise

Keyword〉 Engineering, Technology, Different field

Requirement〉 N/A

Notice〉 N/A

Goal〉 To learn a recent technology , Which is different from the main technology in your field.

Schedule〉

1. Choose a theme on technology or engineering.

Evaluation Criteria〉 Evaluated with portfolio or examination.

Textbook〉 Ask to teachers.

Reference〉 Prints.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125021/

Student〉 Able to be taken by only specified class(es)

Contact〉 教務係.

Intelligent Structures and Mechanics Systems Engineering — Mechanical Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Human Factors ..... WEB page, CMS
  - Life Science ..... WEB page, CMS
  - Social Science ..... WEB page, CMS
  - Science and Technology Studies ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Presentation Method (D) ..... WEB page, CMS
  - Internship (D) ..... WEB page, CMS
  - Venture Business (D) ..... WEB page, CMS
- *Specialized Subjects*
  - Quantum Theory of Materials ..... WEB page, CMS
  - Radio Frequency Solid State Physics ..... WEB page, CMS
  - Controlling Physical Properties of Crystalline Materials ..... WEB page, CMS
  - Material Applications ..... WEB page, CMS
  - Material and Computational Mechanics ..... WEB page, CMS
  - Fluid Energy Control ..... WEB page, CMS
  - Thermal Energy Control ..... WEB page, CMS
  - Multiphase Fluids Transport ..... WEB page, CMS
  - Energy and Environment Engineering ..... WEB page, CMS
  - Mechanical Systems Design ..... WEB page, CMS
  - Instrument and Control Engineering ..... WEB page, CMS
  - Design of Dynamic Systems ..... WEB page, CMS
  - Advanced Production Technology ..... WEB page, CMS
  - Micro-Nano Engineering ..... WEB page, CMS
  - Materials Surface Performance Control ..... WEB page, CMS
  - Intelligent Information Systems ..... WEB page, CMS
  - Visual pattern processing ..... WEB page, CMS
  - Advanced conversion systems of resource energy ..... WEB page, CMS
  - Advanced Micro-Nano Engineering ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Exercise on Mechanical Engineering ..... WEB page, CMS
  - Advanced Research on Mechanical Engineering ..... WEB page, CMS

Earth and Life Environmental Engineering

Earth and Life Environmental Engineering — Chemical Science and Technology
Syllabus of subjects

List of Subjects

Human Factors

Part-time Lecturer · Atsuya Yoshida (2 units)

Target〉 The objective of this class is to provide students with sufficiently thorough appreciation of the many facets of the human factors discipline so that they may make use of it to their own doctoral works.

Outline〉 This class offers a broad and comprehensive overview of the human factors/ergonomics discipline with four areas of emphasis, (1) historical review of human factors research, (2) human physical, perceptual and cognitive capabilities and limitations, (3) application of human factors research data in design, especially in the interface design of computer-based systems, and (4) discussion about the relationship between the designed system (technology) and people.

Schedule〉

1. What is Human Factors
2. Historical Overview of Human Factors
3. Multi-Disciplinary Aspect of Human Factors
4. Health and Safty Issue of Human Factors
5. Human Psychological Capability
6. Task Analysis
7. Human Error
8. Universal Design
9. Cognitive Artifact
10. Visibility and Affordance
11. Human-Computer Interaction
12. Human Information Processing
13. Knowledge and Mental Model
14. Usability Paradigms and Principles
15. Evaluation and Testing
16. Making system that makes us smart

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124976/

Life Science

Part-time Lecturer · Hiroshi Takagi, *Professor* · Akihiko Tsuji (2 units)

Target〉 Understanding of significance of protein in biotechnology

Outline〉 Basics of structure, function and application of protein are introduced

Style〉 Lecture

Keyword〉 Protein, Enzyme, Biotechnology

Goal〉

1. Understanding of multiple functions of proteins
2. Understanding of principle of protein engineering and its application

Schedule〉

1. Introduction of life science
2. History of life science
3. Structure and function of DNA and RNA
4. mRNA is a template of protein
5. Duplication of DNA
6. Regulation of protein expression
7. Human Genetics
8. Genetic disease
9. DNA diagnosis
10. Structure and function of protein
11. Principle of gene technology (1)
12. Principle of gene technology (2)
13. Protein engineering
14. Future of life science (1)
15. Future of life science (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124977/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Social Science

Part-time Lecturer · (2 units)

Target〉 The mutual relationship of economic activities, the structure and function of economic society, and the concept and technique of mathematical programming modelling are lectured.

Outline〉 Not only the mutual relationship of economic activities is explained from domestic and international points of view, but also the technique of case studies by application of mathematical programming models is tought using the various kinds of materials and examples.

Keyword〉 Economic activities, Structure and function, Mathematical programming model

Goal〉 To understand the mutual relationship of economic activities, empirically explain them using the mathematical programming model and evaluate the model.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of economic activities 1
3. Examples of economic activities 2
4. Examples of economic activities 3
5. Change in structure of economic society 1
6. Change in structure of economic society 2
7. Function of economic society 1
8. Function of economic society 2
9. Mutual relationship of economic activities 1
10. Mutual relationship of economic activities 2
11. Concept of mathematical programming model
12. Technique of model construction
13. Modelling of economic activities 1
14. Modelling of economic activities 2
15. Evaluation of modelling

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124978/

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Science and Technology Studies

Part-time Lecturer · (2 units)

Target〉 Let to learn the minimum essentials of science and technology studies and its function in contemporary society.

Outline〉 The science and technology studies deal with science and technology research and its outcomes by means of various methods of social science and humanities. The discipline emerged in 1930s when social importance of science and technology became evident. Since 1970s, the science and technology studies have developed as mission oriented learning for government policy, buisiness administrations and civic activity. students are expected to learn the outline of this discipline : the philosophy of science, history of science and technology, and sociology of science and technology, as well as their application to the problems in contemporary society since 1970s.

Style〉 Lecture

Goal〉

1. Understanding of the minimum essentials of the science and technology
2. Understanding of the social meaning of each student's research

Schedule〉

1. Introduction: A brief history of the science and technology studies since 1930s
2. Philosophical understanding of science: (1) Greek classics and scholastic study
3. Philosophical understanding of science: (2) Science study in Enlightenment and German Classics
4. Philosophical understanding of science: (3) Rise of the philosophy of science in the early twentieth century
5. Historical investigation of science and technology : (1) Emergence of the modern science
6. Historical investigation of science and technology : (2) technology in the Medieval West and the non -Western World
7. Historical investigation of science and technology : (3) Significance of the Industrial Revolution
8. Sociology of science and technology: (1) Normative structure and Paradigm
9. Sociology of science and technology: (2) Social constructivism and Laboratory life analysis
10. The 1950s model of science and technology policy in the Cold War
11. Innovation and Science and Technology
12. Knowledge industrial society since 1970s: (1) Environmental problem and energy prpblem
13. Knowledge industrial society since 1970s: (2) Computer science and Information society
14. Science and technology in the global economy since 1990s
15. Concluding remark: Science and technology in the future

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124979/

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124980/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124981/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Presentation Method (D)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124982/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (D)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal. (2)
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124983/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (D)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124984/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Advanced Molecular Design

Associate Professor · Makiko Seno, *Assistant Professor* · Tomohiro Hirano (2 units)

Target〉 The purpose of this class is to understand the principles of precise synthesis and polymerization reactions from the viewpoint of ligand design, asymmetric induction, etc.

Outline〉 Advanced discussion of current aspects of molecular design. Organic reaction mechanism and molecular design. Polymer synthesis, polymerization mechanism, and macromolecular design. Supramolecular chemistry. Correlation between inter-or intramolecular structure and chemical reactivity or functionality.

Style〉 Portfolio

Keyword〉 chain polymerization, living polymerization, stereospecific polymerization

Fundamental Lecture〉 "Advanced Topics in Polymerization Reactions"(1.0, ⇒100 page)

Relational Lecture〉 "Functional Materials"(0.5, ⇒363 page)

Requirement〉 Requires undergraduate level knowledge of organic and polymer chemistry.

Goal〉

1. To understand the principles of precise synthesis.
2. To understand the principles of precise polymerization.

Schedule〉

1. organic radicals
2. radical structure and ESR
3. radical structure and reactivity
4. molecular design based on radical mechanism
5. synthesis of functional polymers by radical polymerization
6. polymerization with heterogeneous catalysts
7. polymerization with homogeneous catalysts
8. polymerization with transition metal catalysts - stereocontrol
9. reaction control by Lewis acids
10. stereospecific polymerization
11. reaction field and molecular design
12. molecular assembly and molecular design
13. reaction control in asymmetric field
14. application of physical gels to polymerization reaction
15. molecular design and synthesis of dendritic polymers

Evaluation Criteria〉 Assignments counts 100% mainly based on the report submitted.

Textbook〉 To be annouced in the class.

Reference〉 To be annouced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125023/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Seno (G408, +81-88-656-7404, seno@chem.tokushima-u.ac.jp)
⇒ Hirano (G405, +81-88-656-7403, hirano@chem.tokushima-u.ac.jp)

Advanced Molecular Transformations

Professor · Yasuhiko Kawamura, *Part-time Lecturer* · Makoto Wada (2 units)

Target〉 Let students understand the latest synthetic methodology of highly functionallized organic molecules. The method enhances both the energy and atomic efficiency.

Outline〉 This lecture shows modern synthetic methodologies, i.e. reagents, synthetic design, and synthetic processes, etc., which are situated as a basic concept of the synthesis of biologically active molecules and of high functionallized organic molecules.

Style〉 Lecture in combination with Portfolio

Keyword〉 Biologically active molecule, Organometallic compound, Microwave, Green sustainable chemistry, Excited state chemistry

Fundamental Lecture〉 "Advanced Organic Chemistry"(1.0, ⇒99 page)

Relational Lecture〉 "Advanced Molecular Design"(0.5, ⇒360 page)

Requirement〉 Students should have sound knowledge of organic chemistry of the master-course level.

Goal〉

1. Understanding the synthetic method of biologically active molecules by microwave activation.
2. Understanding environmentally friendly and highly stereoselective organic syntheses by using organometallic reagents.
3. Understanding the organic reaction mechanism and basic computer chemistry.

Schedule〉

1. Introduction to the microwave chemistry
2. Microwave excitation and its application
3. Application of the microwave excitation to the molecular conversion (1)
4. Application of the microwave excitation to the molecular conversion (2):
5. Introduction of the green, homogenious organometallic catalyst to the highly selective organic synthesis
6. Application of the green, homogenious organometallic catalyst to the highly selective organic synthesis
7. Introduction of the green, solid acidic catalyst to organic synthesis
8. Application of the green, solid acidic catalyst to organic synthesis
9. Application of the green, solid catalyst to the hoghly selective oxidation reaction
10. Molecular modelling: molecular orbital theory 1
11. Molecular modelling: molecular orbital theory 2
12. Excited state chemistry 1: Interaction of organic molecules with light
13. Excited state chemistry 2: Reaction mechanisms of the photoexcited organic molecules
14. Excited state chemistry 3: Reaction mechanisms of the photoexcited organic molecules
15. Excited state chemistry 4: Application of the photoexcited molecules

Evaluation Criteria〉 Credit is given to the students who earn the total 60% up scores. The score is assigned by evaluating the reports submitted.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125024/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kawamura (410 Chem Bldg, +81-88-656-7401, kawamura@chem.tokushima-u.ac.jp)

Chemical Process Design and Development

Professor · Shigeru Sugiyama, *Assistant Professor* · Ken-Ichiro Sotowa (2 units)

Target〉 The purpose of this class is to introduce the basic theory of both reaction engineering and plant engineering

Outline〉 The required properties of industrial catalysts, as well as their application to industrial processes will be explained. The recent techniques to analyze the local structure of active sites will also be introduced. An emphasis is placed on the application of XPS, EXAFS and solid NMR. Portfolio style is also available.

Style〉 Lecture in combination with Portfolio

Keyword〉 catalyst, NMR, EXAFS, chemical reactor, microreactor

Fundamental Lecture〉 "Surface Science and Technology"(0.5, ⇒365 page), "Advanced Molecular Transformations"(0.4, ⇒361 page)

Relational Lecture〉 "Advanced Molecular Design"(0.3, ⇒360 page), "Materials Chemistry"(0.3, ⇒364 page)

Requirement〉 Requires undergraduate level knowledge of catalyst chemistry and reaction engineering.

Goal〉

1. To understand the state of art of industrial catalysts and its industrial applications in the lectures from 1st to 5th and 11th to 13th.
2. To understand the advanced technique of analysing local structure of catalysts in the lectures from 6th to 10th and 14th to 15th.

Schedule〉

1. Industrial catalysts(1): State of art of reactors and catalysts
2. Industrial catalysts(2): Catalyst preparation
3. Industrial catalysts(3): Status and future of catalysts for chemicals' production
4. Industrial catalysts(4): Status and future of catalysts for environment protection
5. Industrial catalysts(5): Applcations to industrial plants, including microreactors
6. Analysis of local structure (1): XPS
7. Analysis of local structure (2): Introduction to EXAFS.
8. Analysis of local structure (3): Application of EXAFS.
9. Analysis of local structure (4): Introduction to solid state NMR.
10. Analysis of local structure (5): Application of solid state NMR.
11. Case study (1)
12. Case study (2)
13. Case study (3)
14. Case study (4)
15. Case study (5). Submission of the report on the present course will be requested.

Evaluation Criteria〉 Assignments counts 100% mainly based on the report submitted.

Textbook〉 To be annouced in the class

Reference〉 To be annouced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125025/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Sugiyama (G309, +81-88-656-7432, sugiyama@chem.tokushima-u.ac.jp)
⇒ Sotowa (Chemistry and biotechnology building, 307., +81-88-656-4440, sotowa@chem.tokushima-u.ac.jp)16:00-17:00 on Monday and Tuesday.

Functional Materials

Professor · Junko Motonaka, *Associate Professor* · Keiji Minagawa, Mikito Yasuzawa (2 units)

Target〉 To understand functions and applications of various functional materials.

Outline〉 This class introduces various materials based on functional polymers. The mechanism and design of physical and chemical functions of polymer materials are introduced in detail.

Style〉 Portfolio

Keyword〉 Functional Material, Functional Polymer, Sensor Material, Soft Matter, Biocompatible Material

Goal〉

1. To understand properties and applications of various functional materials.
2. To understand mechanisms of functions and application method of material design.

Schedule〉

1. Introduction to Functional Materials
2. Functional Polymers as Sensor Materials
3. Preparation of Various Sensors
4. Analysis of Sensor Properties
5. Evaluation of Sensor Properties
6. Characteristics and Preparation of Soft Matter
7. Properties of Polymer Solution
8. Thermosensitive Polymer Materials
9. Rheology of Soft Matter
10. Rheological Function of Materials
11. Design and Synthesis of Biocompatible Materials
12. Evaluation of Biocompatible Materials and its Application
13. Design and Synthesis of Electroconductive Polymers
14. Evaluation of Electroconductive Polymers and its Application
15. Surface Functional Modification
16. まとめ

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125026/

Contact〉

⇒ Motonaka (G611, +81-88-656-7409, motonaka@chem.tokushima-u.ac.jp)
⇒ Minagawa (G612, +81-88-656-9153, minagawa@chem.tokushima-u.ac.jp)
⇒ Yasuzawa (G512, +81-88-656-7421, mik@chem.tokushima-u.ac.jp)

Materials Chemistry

Associate Professor · Yasuhiro Uosaki, *Professor* · Eiji Kanezaki, *Associate Professor* · Hiroshi Matsui (2 units)

Target〉 To understand the molecular aspects of solid-state properties and/or fluid properties of materials(Uosaki). To understand the structure and electronic states of molecular crystal including metal ions(Kanezaki).

Outline〉 Molecular, atomic and ionic aspects of experimental approach for materials chemistry are lectured on the basis of physical chemistry. In order to understand the synthesis and the characterization of inorganic, organic and inorganic-organic composite materials, recent advances in electrochemistry, quantum chemistry, thermodynamics, surface chemistry and solid state chemistry are presented in relation to the properties depending on the association-condition of materials, the catalytic function of electrode, the application of STM to developing new materials etc. Design of the desirable properties for some new materials is also discussed.

Style〉 Lecture

Keyword〉 Material Development, Supercritical fluids

Fundamental Lecture〉 "Advanced exercise on chemical science and technology"(1.0, ⇒368 page), "Advanced research on chemical science and technology"(1.0, ⇒369 page)

Relational Lecture〉 "Advanced exercise on chemical science and technology"(0.5, ⇒368 page), "Advanced research on chemical science and technology"(1.0, ⇒369 page)

Requirement〉 not particular needed

Goal〉

1. To understand the structures and properties of fluids and to develop an ability to apply supercritical fluids to environmental problems
2. ablility for discussiong properties of condensed phases from the aspect of molecules

Schedule〉

1. Structures of fluids
2. Properties of fluids
3. Physical properties of supercritical fluids (1)
4. Physical properties of supercritical fluids (2)
5. Applications of supercritical fluids
6. Nature of molecules(1)
7. Nature of molecules(2)
8. electronic states of molecules(1)
9. electronic states of molecules(2)
10. electronic states of molecules(3)
11. electronic states of molecules(4)
12. electronic states of molecules(5)
13. molecular assembly(1)
14. molecular assembly(2)
15. molecular assembly(3)
16. examination

Evaluation Criteria〉 Evaluation is made by means of examination and presentation.

Textbook〉 Will be intriduced at the first lecture.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125027/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Uosaki (G510, +81-88-656-7417, uosaki@chem.tokushima-u.ac.jp)
⇒ Kanezaki (G516, +81-88-656-9444, kanezaki@chem.tokushima-u.ac.jp)

Surface Science and Technology

Associate Professor · Toshihiro Moriga (2 units)

Target〉 The purpose of this class is to understand the basic characteristics of surface and bulk and their differences, which are necessary in developing new material science.

Outline〉 This class will introduce surface structures and surface phenomena, governing the physical properties of cunbustion catalysts, electrode materials for fuel cell, transparent conducting materials, phosphors and oxynitrides for photocatalysts, and fundamentals of surface modifications for advanced functional materials.

Style〉 Portfolio

Keyword〉 bulk, surface, photocatalyst, transparent conducting oxide, solid oxide fuel cell, phosphor, X-ray photoelectron spectroscopy, X-ray absorption fine structure

Fundamental Lecture〉 "Physical Properties of Materials"(0.2), "Chemical Plant Design"(0.2), "Material Science"(0.2), "Advanced Materials Science"(0.2, ⇒106 page)

Relational Lecture〉 "Advanced exercise on chemical science and technology"(0.5, ⇒368 page), "Advanced research on chemical science and technology"(0.5, ⇒369 page)

Requirement〉 Nothing special.

Notice〉 Reports should be submitted within two weeks after the assignment.

Goal〉 To understand the outline of materials in which their surface structures and surface phenomena are effectively used.

Schedule〉

1. Orientation
2. Recent topics on metal oxynitrides for photocatalysts -1-
3. Recent topics on metal oxynitrides for photocatalysts -2-
4. Recent topics on transparent conducting oxides thin films -1-
5. Recent topics on transparent conducting oxides thin films -2-
6. Recent topics on transparent conducting oxides thin films -3-
7. Recent topics on X-ray spectroscopy -1-
8. Recent topics on X-ray spectroscopy -2-
9. Recent topics on X-ray spectroscopy -3-
10. Recent topics on phosphors for white LEDs -1-
11. Recent topics on phosphors for white LEDs -2-
12. Recent topics on conbustion catalysts -1-
13. Recent topics on conbustion catalysts -2-
14. Recent topics on electrode materials for fuel cells -1-
15. Recent topics on electrode materials for fuel cells -2-
16. Final reports, dissertational defense

Evaluation Criteria〉 Assignment counts 100% based on the reports submitted and on the result of dissertational defense.

Textbook〉 To be announced in the class.

Reference〉 To be announced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125028/

Student〉 Able to be taken by student of other department

Contact〉 Moriga (M603, +81-88-656-7423, moriga@chem.tokushima-u.ac.jp)Monday 4:30pm—5:30pm for 1st semester, Thursday 4:30pm—5:30pm for 2nd semester

Transport Process Engineering

Professor · Tahei Tomida, *Associate Professor* · Masahiro Katoh (2 units)

Target〉 The purpose of this class is to understand the transport phenomena on the interface of differential phases (gas, liquid and solid) for production and environmental preservation processes.

Outline〉 Interfacial mass transfer analysis in various production and environmental processes, with an emphas is on the process systemization based on the manipulation of fluid flow near material surfaces and molecular transport in functional materials matrices. Analysis and design of chemical separation processes in terms of the molecular transport control within membranes and porous structures. Design of high functional porous micro-structured materials and spectroscopic analysis of molecular transfer phenomina in these materials.

Style〉 Portfolio

Keyword〉 mass transfer, separation processes

Fundamental Lecture〉 "Advanced Separation Technology"(1.0, ⇒105 page)

Requirement〉 Nothing special

Goal〉

1. To understand transport phenomena on interface of differential phases
2. To understand analysis method of the phenomena in micro porous for separation processes

Schedule〉

1. The principle of mass transfer
2. Mass transfer on gas-liquid interface
3. Mass transfer on gas-solid interface
4. Mass transfer on solid-liquid interface
5. Mass transfer process using membrane
6. Adsorption separation processes
7. Adsorption velocity and diffusion
8. Porous materials
9. Synthesis of porous materials
10. Analysis of porous materials
11. Adsorption processes using zeolites
12. The control of molecular transfer in micro porous materials
13. High functionalized porous materials
14. Analysis of solid materials by IR spectroscopy
15. Spectroscopic analysis for phenomena in porous materials

Evaluation Criteria〉 Assignment counts 100% mainly based on the report submitted.

Textbook〉 To be announced in the class.

Reference〉 To be announced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125029/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Tomida (G312, +81-88-656-7425, tomida@chem.tokushima-u.ac.jp)
⇒ Katoh (M304, +81-88-656-7429, katoh@chem.tokushima-u.ac.jp)

Bioprocess Engineering

Professor · Katsuhiro Kawashiro, Katsuhiro Tamura, *Assistant Professor* · Yoshihisa Suzuki (2 units)

Target〉 This class introduces (1) application of enzymatic reactions to industrial production (Professor Kawashiro), (2) effects of high-pressure gas on biological systems (Professor Tamura) and (3) basic concepts and methods of protein crystallization (Dr. Suzuki).

Outline〉 (Professor Kawashiro) Characteristics and specificity of biocatalysts. Organic synthesis and optical resolution by enzymatic reactions. Enzymatic reactions in nonaqueous media. Control of enantioselectivity of enzymatic reactions. Application of enzymatic reactions to industry. (Professor Tamura) Estimation of bioactivities of microorganisms by calorimetry and its application to ecology. Response of microorganisms to physical and chemical stresses. Behaviors of microorganisms under high pressure. Physical properties of liposomal membranes. (Dr. Suzuki) Basic concepts, methods and recent developments of protein crystallization.

Style〉 Lecture

Keyword〉 peptide synthesis, optical resolution, bioassay, Biomembrane, crystal growth

Fundamental Lecture〉 "Basic Physical Chemistry"(1.0), "Biochemical Engineering"(1.0), "Biophysical Chemistry"(1.0)

Relational Lecture〉 "Physico-chemical Excercise 1"(0.5), "Advanced Physical Chemistry"(0.5, ⇒101 page)

Requirement〉 Students are required to have a good understanding of master course-level biochemical and biophysical sciences.

Goal〉

1. To understand the optical resolutions and industrial productions catalyzed by enzymes
2. To understand the effects of high-pressure gas on biological systems
3. To understand the significance of protein crystallization

Schedule〉

1. Enzymatic reaction processes and their applications
2. Properties and catalytic mechanisms of enzymes
3. Peptide syntheses catalyzed by hydrolases
4. Optical resolutions using hydrolases
5. Enantioselectivity of enzymatic reactions in organic media
6. Enzymatic reactions under unusual conditions (freezed aqueous solution)
7. History of high-pressure effects on biological sciences
8. Measurements of metabolic heats of microorganisms under high pressure (1)
9. Measurements of metabolic heats of microorganisms under high pressure (2)
10. Measurements of metabolic heats using a high-pressure gas and its applications for ecological studies
11. Disinfection technology of fluid food products using high-pressure gases
12. Deoxydation technology of fluid food products using high-pressure gases
13. Understandings of the mechanisms of anestic actions using high-pressure gases
14. Structure analysis of protein molecules and significance of protein crystallization
15. Fundamentals of crystal growth
16. Recent topics on protein crystallization

Evaluation Criteria〉 Assignment counts 100%.

Textbook〉 To be anounced in the class

Reference〉 To be anounced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125030/

Contact〉

⇒ Tamura (G509, +81-88-656-7416, tamura@chem.tokushima-u.ac.jp)
⇒ Kawashiro (G308, +81-88-656-7431, kawasiro@chem.tokushima-u.ac.jp)
⇒ Suzuki (G514, +81-88-656-7415, suzuki@chem.tokushima-u.ac.jp)

Advanced exercise on chemical science and technology

All teachers (2 units)

Target〉 To learn how to identify and solve problems in the engineering.

Outline〉 Students will conduct a research work in a field of engineering, and acquire competent knowledge of the field. Students will also learn how to find and solve an engineering problem as an independent researcher.

Keyword〉 research, doctor thesis

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125031/

Advanced research on chemical science and technology

Teachers in other colleges or departments (2 units)

Target〉 To obtain broad information on recent engineering

Outline〉 To research a theme in a technology, which is different from the main technology in your field.

Style〉 Portfolio, Lecture in combination with Portfolio, Lecture and excercise

Keyword〉 Engineering, Technology, Different field

Requirement〉 N/A

Notice〉 N/A

Goal〉 To learn a recent technology, which is different from the main technology in your field

Schedule〉

1. Choose a theme on technology or engineering, which is different from that in your field

Evaluation Criteria〉 Evaluated with portfolio or examination

Textbook〉 Ask teachers

Reference〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125032/

Student〉 Able to be taken by only specified class(es)

Earth and Life Environmental Engineering — Chemical Science and Technology
Web page and CMS related subject

- *Integrated Subjects*
  - Human Factors ..... WEB page, CMS
  - Life Science ..... WEB page, CMS
  - Social Science ..... WEB page, CMS
  - Science and Technology Studies ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Presentation Method (D) ..... WEB page, CMS
  - Internship (D) ..... WEB page, CMS
  - Venture Business (D) ..... WEB page, CMS
- *Specialized Subjects*
  - Advanced Molecular Design ..... WEB page, CMS
  - Advanced Molecular Transformations ..... WEB page, CMS
  - Chemical Process Design and Development ..... WEB page, CMS
  - Functional Materials ..... WEB page, CMS
  - Materials Chemistry ..... WEB page, CMS
  - Surface Science and Technology ..... WEB page, CMS
  - Transport Process Engineering ..... WEB page, CMS
  - Bioprocess Engineering ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced exercise on chemical science and technology ..... WEB page, CMS
  - Advanced research on chemical science and technology ..... WEB page, CMS

Earth and Life Environmental Engineering — Biological Science and Technology
Syllabus of subjects

List of Subjects

Human Factors

Part-time Lecturer · Atsuya Yoshida (2 units)

Target〉 The objective of this class is to provide students with sufficiently thorough appreciation of the many facets of the human factors discipline so that they may make use of it to their own doctoral works.

Outline〉 This class offers a broad and comprehensive overview of the human factors/ergonomics discipline with four areas of emphasis, (1) historical review of human factors research, (2) human physical, perceptual and cognitive capabilities and limitations, (3) application of human factors research data in design, especially in the interface design of computer-based systems, and (4) discussion about the relationship between the designed system (technology) and people.

Schedule〉

1. What is Human Factors
2. Historical Overview of Human Factors
3. Multi-Disciplinary Aspect of Human Factors
4. Health and Safty Issue of Human Factors
5. Human Psychological Capability
6. Task Analysis
7. Human Error
8. Universal Design
9. Cognitive Artifact
10. Visibility and Affordance
11. Human-Computer Interaction
12. Human Information Processing
13. Knowledge and Mental Model
14. Usability Paradigms and Principles
15. Evaluation and Testing
16. Making system that makes us smart

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124976/

Life Science

Part-time Lecturer · Hiroshi Takagi, *Professor* · Akihiko Tsuji (2 units)

Target〉 Understanding of significance of protein in biotechnology

Outline〉 Basics of structure, function and application of protein are introduced

Style〉 Lecture

Keyword〉 Protein, Enzyme, Biotechnology

Goal〉

1. Understanding of multiple functions of proteins
2. Understanding of principle of protein engineering and its application

Schedule〉

1. Introduction of life science
2. History of life science
3. Structure and function of DNA and RNA
4. mRNA is a template of protein
5. Duplication of DNA
6. Regulation of protein expression
7. Human Genetics
8. Genetic disease
9. DNA diagnosis
10. Structure and function of protein
11. Principle of gene technology (1)
12. Principle of gene technology (2)
13. Protein engineering
14. Future of life science (1)
15. Future of life science (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124977/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Social Science

Part-time Lecturer · (2 units)

Target〉 The mutual relationship of economic activities, the structure and function of economic society, and the concept and technique of mathematical programming modelling are lectured.

Outline〉 Not only the mutual relationship of economic activities is explained from domestic and international points of view, but also the technique of case studies by application of mathematical programming models is tought using the various kinds of materials and examples.

Keyword〉 Economic activities, Structure and function, Mathematical programming model

Goal〉 To understand the mutual relationship of economic activities, empirically explain them using the mathematical programming model and evaluate the model.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of economic activities 1
3. Examples of economic activities 2
4. Examples of economic activities 3
5. Change in structure of economic society 1
6. Change in structure of economic society 2
7. Function of economic society 1
8. Function of economic society 2
9. Mutual relationship of economic activities 1
10. Mutual relationship of economic activities 2
11. Concept of mathematical programming model
12. Technique of model construction
13. Modelling of economic activities 1
14. Modelling of economic activities 2
15. Evaluation of modelling

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124978/

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Science and Technology Studies

Part-time Lecturer · (2 units)

Target〉 Let to learn the minimum essentials of science and technology studies and its function in contemporary society.

Outline〉 The science and technology studies deal with science and technology research and its outcomes by means of various methods of social science and humanities. The discipline emerged in 1930s when social importance of science and technology became evident. Since 1970s, the science and technology studies have developed as mission oriented learning for government policy, buisiness administrations and civic activity. students are expected to learn the outline of this discipline : the philosophy of science, history of science and technology, and sociology of science and technology, as well as their application to the problems in contemporary society since 1970s.

Style〉 Lecture

Goal〉

1. Understanding of the minimum essentials of the science and technology
2. Understanding of the social meaning of each student's research

Schedule〉

1. Introduction: A brief history of the science and technology studies since 1930s
2. Philosophical understanding of science: (1) Greek classics and scholastic study
3. Philosophical understanding of science: (2) Science study in Enlightenment and German Classics
4. Philosophical understanding of science: (3) Rise of the philosophy of science in the early twentieth century
5. Historical investigation of science and technology : (1) Emergence of the modern science
6. Historical investigation of science and technology : (2) technology in the Medieval West and the non -Western World
7. Historical investigation of science and technology : (3) Significance of the Industrial Revolution
8. Sociology of science and technology: (1) Normative structure and Paradigm
9. Sociology of science and technology: (2) Social constructivism and Laboratory life analysis
10. The 1950s model of science and technology policy in the Cold War
11. Innovation and Science and Technology
12. Knowledge industrial society since 1970s: (1) Environmental problem and energy prpblem
13. Knowledge industrial society since 1970s: (2) Computer science and Information society
14. Science and technology in the global economy since 1990s
15. Concluding remark: Science and technology in the future

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124979/

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124980/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124981/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Presentation Method (D)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124982/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (D)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal. (2)
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124983/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (D)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124984/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Biofunctional Design of Biomolecules

Professor · Hitoshi Hori (2 units)

Target〉 Advanced review of concepts and strategies in design of biomolecular mimetics and physiologically active molecules based on their structure-activity relationship.

Outline〉 Advanced concepts and engineering-based strategic skills of biofunctional design of biologically active molecules, with particular attention for biomolecular mimetics. Topics of biomolecular mimetics is took up in synthetic organic chemistry, medicinal chemistry, biochemistry, cell biology, molecular biology, and immunology. Hori: Design of biologically active small molecules in synthetic organic chemistry, immunology, and physiology ; Nagasawa: Concepts and engineering-based strategic skills of design of physiologically active molecules based on their structure-activity-relationship in bioorganic chemistry, biochemistry, and molecular biology. Students should discuss about topics of the lecture with the instructor during the term of this course.

Style〉 Lecture

Keyword〉 biofunctional design, biomolecular mimetics, structure-activity-relationship

Goal〉

1. Advanced conceptual and engineering-based strategic skills to research biomolecular mimetics.
2. Advanced conceptual and engineering-based strategic skills for design and study of physiologically active molecules.
3. Advanced biomedical ethical skills for clinical trails and gene therapy.

Schedule〉

1. Hori (1-7, 15) Overview of biomolecular mimetics
2. Principles of organic chemistry
3. Medicinal chemistry-approach
4. Biochemistry chemistry-based approach. Subject review report-1
5. Immunology-based approach
6. Biomolecular mimetics and clinical trials Subject review report-2
7. Discussion on subject review report-1and 2
8. Nagasawa (8-15) Overview of physiologically active molecules
9. Tumor hypoxic microenvironment, biosignal, and antitumor drug-design
10. Carbohydrate function and immunopotentiators. Subject review report-3
11. Structure-activity of neuron-specific proteins and biomedical ethics
12. Ischemia, neuron degeneration, and neuroprotectors
13. Design of supermolecular anti-dementia drugs. Subject review report-4
14. Discussion on subject review report-4
15. Discussion. Summary of this course

Evaluation Criteria〉 Subject review report 1-4 counts 100%.

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125034/

Contact〉 Hori (M821, +81-88-656-7514, hori@bio.tokushima-u.ac.jp)Monday 11:55-12:50

Molecular Microbiology

Professor · Hiroki Kourai, *Associate Professor* · Hideaki Maseda (2 units)

Target〉 This course will cover in depth topics related to current research in the fields of molecular microbiology especially environmental harmful microbial control field.

Outline〉 This course describes environmental harmful microbes, microbial degradation and microbial deterioration, microbial corrosion of metal. Further, new microbial control methodology and new microbial molecular design are lectured.

Style〉 Lecture

Keyword〉 Environmental harmful microbes, Microbial degradation, Microbial deterioration, Antimicrobial molecular design

Fundamental Lecture〉 "Advanced Microbiological Engineering"(1.0, ⇒133 page)

Relational Lecture〉 "Biomolecular Design"(1.0, ⇒134 page)

Requirement〉 Students are required to have a good understanding of undergraduate- and postgraduate-level microbiology and organic chemistry.

Notice〉 Students will be required to read recent research articles on the topics under discussion.

Goal〉

1. To understand an outline of environmental harmful microbes.
2. To understand methodology of new microbial molecular design.

Schedule〉

1. Overview of Environmental microbiology
2. Summary of environmental harmful microbiology
3. Environmental harmful microbiology 1: Bacteria 1.
4. Environmental harmful microbiology 2: Bacteria 2.
5. Environmental harmful microbiology 3: Fungi 1.
6. Environmental harmful microbiology 4: Fungi 2.
7. Subject report-1
8. Overview of antimicrobial agents 1.
9. Overview of antimicrobial agents 2.
10. Quantitative structure-activity relationship 1.
11. Quantitative structure-activity relationship 2.
12. Subject report-2
13. Methodology of new microbial molecular design 1
14. Methodology of new microbial molecular design 2
15. Methodology of new microbial molecular design 3
16. Subject review report-3

Evaluation Criteria〉 Subject review report 1-3 counts 100%

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125035/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Kourai (M813, +81-88-656-7408, kourai@bio.tokushima-u.ac.jp)Friday 16:20-17:20
⇒ Maseda (M814, +81-88-656-7524,)Friday 16:20-17:50

Engineering of Genetic Information

Professor · Sumihare Noji, *Associate Professor* · Hideyo Ohuchi, *Professor* · Yoshinori Matsuo (2 units)

Target〉 To obtain information on recent genetic studies

Outline〉 Lectures on Advanced research on analysis of genetic information of Drosophila, mouse, and human. 2) Analysis of structure and function of the genes based on the genetic information: gene expression, loss of function and gain of function 3) Genetic engineering to create new biological functions. 4) Application of the genetic engineering to improve biological functions. 5) Advanced research on developmental and regeneration biology, focusing on limb development and regeneration. 6) Application of the developmental and regeneration biology to improve biological functions. 7) Recent topics of genetic engineering. 8) Recent topics of developmental biology and its application.

Style〉 Portfolio

Keyword〉 genom sicence, molecular biology, genetic engneering

Relational Lecture〉 "Cell Signaling System"(0.5, ⇒384 page), "Biofunctional Engineering"(0.5, ⇒386 page), "Technology of Enzyme Functions"(0.5, ⇒385 page)

Requirement〉 N/A

Notice〉 N/A

Goal〉 To understand recent information on genetics

Schedule〉

1. Recent advance in genetics, insects
2. Recent advance in genetics, invertebrates
3. Recent advance in genetic engneering, invertebrates
4. Recent advance in genetics, chicken
5. Recent advance in genetic engneering, chicken
6. Recent advance in genetics, mouse
7. Recent advance in genetic engneering, mouse
8. report for evaluation
9. Recent advance in genetics, human
10. Recent advance in genetic engneering, human
11. Recent advance in genetics, plants
12. Recent advance in genetic engneering, plants
13. Recent advance in RNA engineering
14. Recent advance in detection of gene expression
15. Recent advance in recet topics 1
16. Recent advance in recet topics 2
17. Final report

Evaluation Criteria〉 Evaluate two reports (50% each)

Textbook〉 N/A

Reference〉 Handouts

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125036/

Student〉 Able to be taken by student of other department

Contact〉 Noji (G803, +81-88-656-7528, noji@bio.tokushima-u.ac.jp)Monday 15:30-17:00

Cell Signaling System

Professor · Akihiko Tsuji, *Associate Professor* · Masami Nagahama (2 units)

Target〉 This class introduces signaling system which regulates cell functions.

Outline〉 Structure of signaling molecule and cell signaling system are introduced.

Style〉 Lecture

Keyword〉 Growth/differentiation factor, Receptor, Signal transduction

Fundamental Lecture〉 "Cell Biology"(0.5), "Biochemistry 2"(0.3), "Advanced Biochemistry"(0.3, ⇒128 page)

Relational Lecture〉 "Life Science"(0.2, ⇒373 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level cell biology and biochemistry.

Goal〉

1. Understanding of regulatory mechanism of biological activity of signaling molecule
2. Understanding of function of receptor and intracellular signaling system

Schedule〉

1. Introduction of cell signaling system
2. Cell structure and function of organella
3. Post-translational modification of signaling molecule
4. Structure of processing enzyme
5. Function and regulation of processing enzyme
6. Secretion of signaling molecule
7. Structure and function of receptor
8. Protein kinase and protein phosphatase
9. Transcriptional regulation
10. Regulation of cell function by AAA protein (1)
11. Regulation of cell function by AAA protein (2)
12. Recent research on signaling molecule (1)
13. Recent research on signaling molecule (2)
14. Significance of signaling molecule as target for drug design (1)
15. Significance of signaling molecule as target for drug design (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125037/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Technology of Enzyme Functions

Associate Professor · Haruhiko Sakuraba (2 units)

Target〉 This class introduces recent progress in the research of thermophilic enzymes.

Outline〉 Portfolio: Molecular basis of enzyme thermostability and application of thermostable enzyme.

Style〉 Portfolio

Keyword〉 Thermostable enzyme, Thermophile, Structural analysis

Requirement〉 Students are required to have a good understanding of undergraduate-level protein engineering.

Goal〉 To understand recent progress in the research of hyperthermophilic enzymes

Schedule〉

1. The crystal structure of hyperthremostable NAD-dependent glutamate dehydrogenase from Pyrobaculum islandicum
2. A new enzymatic cycling method for ammonia assay using NAD synthetase
3. Highly stable L-lisine 6-dehydrogenase from the thermophile Geobacillus stearothermophilus
4. Expression of foreign proteins in Escherichia coli by fusing with an archaeal FK506 binding protein
5. Gene and primary structures of dye-linked L-proline dehydrogenase from the hyperthermophilic archaeon Thermococcus profundus
6. Novel Archaeal Alanine:Glyoxylate Aminotransferase from Thermococcus litoralis
7. Cloning, Expression, and Characterization of the First Archaeal ATP-Dependent Glucokinase from Aerobic Hyperthermophilic Archaeon
8. The archaeal agmatinase from anaerobic hyperthermophilic archaeon Pyrococcus horikoshii
9. The First Crystal Structure of Archaeal Aldolase
10. A nicotinamide mononucleotide adenylyltransferase with unique adenylyl group donor specificity from a hyperthermophilic archaeon
11. The Sulfolobus tokodaii gene ST1704 codes highly thermostable glucose dehydrogenase
12. L-Aspartate oxidase is present in the anaerobic hyperthermophilic archaeon Pyrococcus horikoshii OT-3
13. Novel energy metabolism in anaerobic hyperthermophilic archaea: the modified Embden-Meyerhof pathway
14. Dye-linked D-Proline Dehydrogenase from Hyperthermophilic Archaeon Pyrobaculum islandicum
15. ADP-Dependent Glucokinase/Phosphofructokinase, a Novel Bifunctional Enzyme from the Hyperthermophilic Archaeon Methanococcus jannaschii

Evaluation Criteria〉 Report (assignments count 100%)

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125038/

Student〉 Able to be taken by only specified class(es)

Contact〉 Sakuraba (M719, +81-88-656-7531, sakuraba@bio.tokushima-u.ac.jp)Friday 16:20-17:50

Biofunctional Engineering

Professor · Shoji Kaneshina, *Associate Professor* · Hitoshi Matsuki (2 units)

Target〉 Biological membranes play an important roll in structure formation and function revelation of cells. Characteristic properties owned by lipid membranes are mainly described and the structure and function of biological membranes are reviewed.

Outline〉 This lecture describes fundamental matters concerning self-association of biomolecules such as structure of water and hydrophobic effect, properties for molecular aggregates of amphiphilic molecules, after that various structure changes for molecular aggregates formed by lipids such as phase transitions, polymorphism, non-bilayer structure and domain formation are explained. Further, significant functions revealed in biological membranes like transport phenomena and mechanisms of drug action and so on are lectured. Portfoilo lessons are also adapted depending on students.

Style〉 Lecture in combination with Portfolio

Keyword〉 Biological membrane, Lipid, Molecular aggregate, Membrane structure, Membrane function

Fundamental Lecture〉 "Biochemical Thermodynamics"(1.0, ⇒127 page), "Advanced Biophysical Chemistry"(1.0, ⇒131 page)

Requirement〉 Students are required to have a good understanding of undergraduate- and postgraduate-level physical chemistry and biophysical chemistry and related subjects.

Goal〉

1. To understand the structures and nature of molecular aggregates formed by lipids, which are components of biological membranes.
2. To understand the functions revealed by biological membranes such as material transport, signal transduction and drug action.

Schedule〉

1. Structures of biological membranes (1) structure of water and hydrophobic interaction
2. Structures of biological membranes (2) self-association of amphiphilic molecules 1: monolayers
3. Structures of biological membranes (3) self-association of amphiphilic molecules 2: micelles
4. Structures of biological membranes (4) bilayer structure and phase transitions of lipid membranes
5. Structures of biological membranes (5) stability and polymorphism of lipid membranes
6. Structures of biological membranes (6) non- bilayer structure of lipid membranes
7. Structures of biological membranes (7) mixed lipid membranes and domain formation
8. Structures of biological membranes (8) fluidization and dynamics of lipid membranes
9. Structures of biological membranes (9) surface and membrane potentials
10. Functions of biological membranes (1) molecular recognition of lipid membranes
11. Functions of biological membranes (2) ion transport (passive and active transport)
12. Functions of biological membranes (3) ion channel and nerve conduction
13. Functions of biological membranes (4) mechanisms of drug action (specific binding)
14. Functions of biological membranes (5) mechanisms of drug action (non-specific binding
15. Functions of biological membranes (6) cell functions and signal transduction
16. Report preparation for structures and functions of biological membranes

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125039/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Kaneshina (G607, +81-88-656-7513, kanesina@bio.tokushima-u.ac.jp)
⇒ Matsuki (G609, +81-88-656-7520, matsuki@bio.tokushima-u.ac.jp)Friday 16:20-17:50

Molecular Pathogenic Microbiology

Professor · Hideaki Nagamune, *Associate Professor* · Toshifumi Tomoyasu (2 units)

Target〉 This class aims to understand the latest findings on molecular feature and application of virulence factors expressed in pathogenic microorganisms.

Outline〉 The latest findings on virulence factors concerned with infectious diseases by pathogenic microorganisms are introduced in this class. Assignments on the introduced topics are set and marked in portfolio system.

Style〉 Portfolio

Keyword〉 pathogenic microorganism, virulence factor, infection

Relational Lecture〉 "Molecular Microbiology"(0.9, ⇒382 page)

Requirement〉 Students are required to have a good understanding of undergraduate-level of microbiology and related subjects

Goal〉

1. To understand the latest molecular information on virulence factors of pathogenic microorganisms
2. To understand the application technology of microbial virulence factors in molecular level

Schedule〉

1. Bacterial toxins 1:CDC pore-forming toxins
2. Bacterial toxins 2:other pore-forming toxins
3. Bacterial toxins 3:neuron-directional enzymatic toxins
4. Bacterial toxins 4:gastrointestinal tissue-directional enzymatic toxins
5. Bacterial toxins 5:translational step-directional enzymatic toxins
6. Bacterial toxins 6:superantigens
7. Plasmids carrying antimicrobial-resistant genes
8. Fungal toxins 1:small molecular toxins
9. Fungal toxins 2:protein toxins
10. Other Bacterial virulence factors 1:adherence/invasion factors
11. Other Bacterial virulence factors 2:enzymes
12. Other Bacterial virulence factors 3:secretion systems
13. Viral virulence factors 1:adherence/invasion factors
14. Viral virulence factors 2:enzymes
15. Viral virulence factors 3:transcriptional factors
16. General Discussion

Evaluation Criteria〉 Assignments count 100%(Goal 1 and 2).

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125040/

Student〉 Able to be taken by only specified class(es)

Contact〉 Nagamune (G707, +81-88-656-7525, nagamune@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Advanced Exercise on Biological Science and Technology

Teacher of course (2 units)

Target〉 To obtain broad information in addition to information on own field

Outline〉 To learn recent biological technology and experimental techniques

Style〉 Portfolio

Keyword〉 Biology, Technology, Experiment

Relational Lecture〉 "Engineering of Genetic Information"(0.5, ⇒383 page), "Technology of Enzyme Functions"(0.5, ⇒385 page), "Cell Signaling System"(0.5, ⇒384 page)

Requirement〉 N/A

Notice〉 N/A

Goal〉 To understand recent biology and biothechnology

Schedule〉

1. To learn recent biotechnology under direction of a teacher working on bioengineerig

Evaluation Criteria〉 Evaluated with portfolios

Textbook〉 Not specified

Reference〉 Provided by teachers

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125041/

Student〉 Able to be taken by only specified class(es)

Contact〉 Administration Office(M703)

Advanced Research on Biological Science and Technology

(2 units)

Target〉 To obtain broad information on recent engineering

Outline〉 To research a theme in a technology, which is different form the main technology in your field.

Style〉 Portfolio, Lecture in combination with Portfolio, Lecture and excercise

Keyword〉 Engineering, Technology, Different field

Requirement〉 N/A

Notice〉 N/A

Goal〉 To learn a recent technology, which is different from the main technology in your field

Schedule〉

1. Choose a theme on thechnology or engineering, which is different from that in your field.

Evaluation Criteria〉 Evaluated with portfolio or examination

Textbook〉 Ask to teachers

Reference〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125042/

Student〉 Able to be taken by only specified class(es)

Contact〉 指導教員

Earth and Life Environmental Engineering — Biological Science and Technology
Web page and CMS related subject

- *Integrated Subjects*
  - Human Factors ..... WEB page, CMS
  - Life Science ..... WEB page, CMS
  - Social Science ..... WEB page, CMS
  - Science and Technology Studies ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Presentation Method (D) ..... WEB page, CMS
  - Internship (D) ..... WEB page, CMS
  - Venture Business (D) ..... WEB page, CMS
- *Specialized Subjects*
  - Biofunctional Design of Biomolecules ..... WEB page, CMS
  - Molecular Microbiology ..... WEB page, CMS
  - Engineering of Genetic Information ..... WEB page, CMS
  - Cell Signaling System ..... WEB page, CMS
  - Technology of Enzyme Functions ..... WEB page, CMS
  - Biofunctional Engineering ..... WEB page, CMS
  - Molecular Pathogenic Microbiology ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Exercise on Biological Science and Technology ..... WEB page, CMS
  - Advanced Research on Biological Science and Technology ..... WEB page, CMS

Earth and Life Environmental Engineering — Ecosystem Engineering
Syllabus of subjects

List of Subjects

Human Factors

Part-time Lecturer · Atsuya Yoshida (2 units)

Target〉 The objective of this class is to provide students with sufficiently thorough appreciation of the many facets of the human factors discipline so that they may make use of it to their own doctoral works.

Outline〉 This class offers a broad and comprehensive overview of the human factors/ergonomics discipline with four areas of emphasis, (1) historical review of human factors research, (2) human physical, perceptual and cognitive capabilities and limitations, (3) application of human factors research data in design, especially in the interface design of computer-based systems, and (4) discussion about the relationship between the designed system (technology) and people.

Schedule〉

1. What is Human Factors
2. Historical Overview of Human Factors
3. Multi-Disciplinary Aspect of Human Factors
4. Health and Safty Issue of Human Factors
5. Human Psychological Capability
6. Task Analysis
7. Human Error
8. Universal Design
9. Cognitive Artifact
10. Visibility and Affordance
11. Human-Computer Interaction
12. Human Information Processing
13. Knowledge and Mental Model
14. Usability Paradigms and Principles
15. Evaluation and Testing
16. Making system that makes us smart

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124976/

Life Science

Part-time Lecturer · Hiroshi Takagi, *Professor* · Akihiko Tsuji (2 units)

Target〉 Understanding of significance of protein in biotechnology

Outline〉 Basics of structure, function and application of protein are introduced

Style〉 Lecture

Keyword〉 Protein, Enzyme, Biotechnology

Goal〉

1. Understanding of multiple functions of proteins
2. Understanding of principle of protein engineering and its application

Schedule〉

1. Introduction of life science
2. History of life science
3. Structure and function of DNA and RNA
4. mRNA is a template of protein
5. Duplication of DNA
6. Regulation of protein expression
7. Human Genetics
8. Genetic disease
9. DNA diagnosis
10. Structure and function of protein
11. Principle of gene technology (1)
12. Principle of gene technology (2)
13. Protein engineering
14. Future of life science (1)
15. Future of life science (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124977/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Social Science

Part-time Lecturer · (2 units)

Target〉 The mutual relationship of economic activities, the structure and function of economic society, and the concept and technique of mathematical programming modelling are lectured.

Outline〉 Not only the mutual relationship of economic activities is explained from domestic and international points of view, but also the technique of case studies by application of mathematical programming models is tought using the various kinds of materials and examples.

Keyword〉 Economic activities, Structure and function, Mathematical programming model

Goal〉 To understand the mutual relationship of economic activities, empirically explain them using the mathematical programming model and evaluate the model.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of economic activities 1
3. Examples of economic activities 2
4. Examples of economic activities 3
5. Change in structure of economic society 1
6. Change in structure of economic society 2
7. Function of economic society 1
8. Function of economic society 2
9. Mutual relationship of economic activities 1
10. Mutual relationship of economic activities 2
11. Concept of mathematical programming model
12. Technique of model construction
13. Modelling of economic activities 1
14. Modelling of economic activities 2
15. Evaluation of modelling

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124978/

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Science and Technology Studies

Part-time Lecturer · (2 units)

Target〉 Let to learn the minimum essentials of science and technology studies and its function in contemporary society.

Outline〉 The science and technology studies deal with science and technology research and its outcomes by means of various methods of social science and humanities. The discipline emerged in 1930s when social importance of science and technology became evident. Since 1970s, the science and technology studies have developed as mission oriented learning for government policy, buisiness administrations and civic activity. students are expected to learn the outline of this discipline : the philosophy of science, history of science and technology, and sociology of science and technology, as well as their application to the problems in contemporary society since 1970s.

Style〉 Lecture

Goal〉

1. Understanding of the minimum essentials of the science and technology
2. Understanding of the social meaning of each student's research

Schedule〉

1. Introduction: A brief history of the science and technology studies since 1930s
2. Philosophical understanding of science: (1) Greek classics and scholastic study
3. Philosophical understanding of science: (2) Science study in Enlightenment and German Classics
4. Philosophical understanding of science: (3) Rise of the philosophy of science in the early twentieth century
5. Historical investigation of science and technology : (1) Emergence of the modern science
6. Historical investigation of science and technology : (2) technology in the Medieval West and the non -Western World
7. Historical investigation of science and technology : (3) Significance of the Industrial Revolution
8. Sociology of science and technology: (1) Normative structure and Paradigm
9. Sociology of science and technology: (2) Social constructivism and Laboratory life analysis
10. The 1950s model of science and technology policy in the Cold War
11. Innovation and Science and Technology
12. Knowledge industrial society since 1970s: (1) Environmental problem and energy prpblem
13. Knowledge industrial society since 1970s: (2) Computer science and Information society
14. Science and technology in the global economy since 1990s
15. Concluding remark: Science and technology in the future

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124979/

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124980/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124981/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Presentation Method (D)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124982/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (D)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal. (2)
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124983/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (D)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124984/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Advanced Topics in Atoms and/or Molecules Manipulation

Professor · Shuichi Hashimoto, *Associate Professor* · Shigeki Matsuo (2 units)

Target〉 New methdologies for the manipulation of the atoms and molecules in materilas will be presented and students are encouraged to gain skills to think about to solve problems in this field

Outline〉 New methodologies will be given for mamipulating atoms and molecuels, controling physical and chemical properties, and fabricating micro- and nanostructures based upon optical/laser techniques

Style〉 Portfolio

Goal〉 To acquire knowledge of the properies of materials to the level of atoms and molecules

Schedule〉

1. Photophysical processes
2. Photophysical processes
3. Photochemical processes
4. Photochemical Processes
5. Two-photon processes
6. laser trapping
7. laser trapping
8. laser ablation
9. laser ablation
10. laser micro processing
11. laser micro fabrication
12. phtonic crystals
13. laser crystallization
14. New topics
15. New topics

Evaluation Criteria〉 Assignments counts 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125044/

Advanced conversion systems of resource energy

Professor · Kei Miwa, *Associate Professor* · Yoshiyuki Kidoguchi (2 units)

Target〉 To learn special knowledge concerning present energy resources and energy supplying systems, to understand principle and mechanism of energy conversion, and to improve thinking faculty for application of new energy and its conversion

Outline〉 To explain effective combustion technologies, reasonable utilization of energy and application of unused energy for saving consumption of fossil fuels and primary energy on the point of saving resources, energy and preserving the environment

Style〉 Portfolio

Keyword〉 Energy conversion, Energy resources, Utilization of energy, Environmental protection, Energy saving

Requirement〉 None

Notice〉 None

Goal〉 To understand fundamentals of energy conversion and to consider effective utilization of energy and improvement of energy conversion technologies

Schedule〉

1. Present state of energy resources
2. Energy and environmental problem
3. Future view of energy resources
4. Fundamentals of energy conversion (1)
5. Fundamentals of energy conversion (2)
6. Principle of energy conversion (1)
7. Principle of energy conversion (2)
8. Principle of energy conversion (3)
9. Technologies of energy conversion (1)
10. Technologies of energy conversion (2)
11. Technologies of energy conversion (3)
12. Approach to effective utilization of energy (1)
13. Approach to effective utilization of energy (2)
14. Application of new energy (1)
15. Application of new energy (2)

Evaluation Criteria〉 Appraise the understanding of the content of the lecture by setting some reports

Textbook〉 None

Reference〉 None

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/miwa/index.html

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125045/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Miwa (Eco503, +81-88-656-7370, miwa@eco.tokushima-u.ac.jp)
⇒ Kidoguchi (Eco502, +81-88-656-9633, kidog@eco.tokushima-u.ac.jp)

Note〉 Need to submit some reports

Advance Lecture of Political Simulation

Professor · Akio Kondo, *Associate Professor* · Yoshinobu Hirose (2 units)

Target〉 The technique of modelling of regional and environmental systems, and the concept and application method of prediction and evaluation models to political simulation are studied.

Outline〉 Not only the technique of modelling, but also the application method of prediction and evaluation models to political simulation is discussed in portfolio.

Style〉 Portfolio

Keyword〉 Political Simulation, Technique of Modelling, Prediction and Evaluation

Requirement〉 特になし

Notice〉 特になし

Goal〉 To obtain the knowledge of the technique of modelling and application method of prediction and evaluation models, apply them to political simulation.

Schedule〉

1. Guidance and purpose of this subject
2. Systems of political simulation
3. Technique of modelling 1
4. Technique of modelling 2
5. Application of model : Prediction 1
6. Application of model : Prediction 2
7. Application of model : Evaluation of policy 1
8. Application of model : Evaluation of policy 2
9. Example of political simulation : Population policy
10. Example of political simulation : Urban transport policy
11. Example of political simulation : Landuse policy
12. Example of political simulation : Social policy
13. Example of political simulation : Environment policy
14. The technique of political simulation in the future
15. Regional policies in the 21st Century

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Webpage〉 http://www.eco.tokushima-u.ac.jp/w3/kondo/top/index.htm

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125046/

Student〉 Able to be taken by only specified class(es)

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Note〉 特になし

Advanced Lecture in Social Risk Engineering

Professor · Hitoshi Murakami, *Associate Professor* · Yasunori Kozuki (2 units)

Target〉 To understand concept of risk, to cultivate ability of measures how to reduce , avoid, compensate for various risiks. the reducing, the evading of the risk, the compensation for it.

Outline〉 Technique of risk assessment and its comunication for various social risiks on risk manegement is lecterd.

Style〉 Lecture in combination with Portfolio

Keyword〉 Social Risks, Risk Management, Crisis Management

Goal〉 To obtain the knowledge of risk management and application method of various social risks.

Schedule〉

1. Guidance and purpose of this subject
2. Sources of various social risks
3. Evaluation of social risk(1)
4. Evaluation of social risk(2)
5. Risk manegement (1.risik perception)
6. Risk manegement(2.risik communication)
7. Risk manegement(3.evaluation standard)
8. Example of risik manegement(1.evacuation for natural disaster)
9. Example of risik manegement(2.evacuation for natural disaster)
10. Example of risik manegement(3.evacuation for natural disaster)
11. Example of risik manegement(4.avoidance of risik and insurerance)
12. Presentaion and discusion for social risk(1)
13. Presentaion and discusion for social risk(2)
14. Presentaion and discusion for social risk(3)
15. Summary

Evaluation Criteria〉 Assignments Count 100%

Textbook〉 To be introduced in the class

Reference〉 To be intrroduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125047/

Student〉 To be limited to the students of the course

Contact〉 Murakami (Eco504, +81-88-656-7334, murakami@eco.tokushima-u.ac.jp)Monday 16:20-17:50

Design for Adapting the Environment Instead of the Peop

Professor · Osamu Sueda, *Associate Professor* · Shoichiro Fujisawa (2 units)

Target〉 The objective of this lecture is to consider the role of assitive technology for the persons with disabilities living in the society and to learn on the development of assistive products in the view point of human factors and outcome measure in daily living with assistive products.

Outline〉 Assistive technology for a disabled individual living in the society. Human factors and R & D of assistive devices and services. Adapting the environment instead of the disabled people. Evaluation of appropriateness of assistive technology system for a person.

Style〉 Lecture

Keyword〉 Assistive products, Outcome measure, Persons with disability, Research and development, Ergonomics

Goal〉 An expertise necessary to research and develop an actual assistive products is acquired. The method of outcome measure for assistive products will be mastered.

Schedule〉

1. Guidance
2. Human factors in physical view point (1)
3. Human factors in anatomical view point (2)
4. Human factors in phychological view point (3)
5. Adapting the people to the environment
6. Adapting the environment insted of the people
7. Physical impairment and daily living support
8. Sensory impairment and daily living support
9. Intellectual impairment and daily living support
10. R&D of assistive products and ergonomic approach (1)
11. R&D of assistive products and ergonomic approach (2)
12. R&D of assistive products based on daily living (1)
13. R&D of assistive products based on daily living (2)
14. Outcome measure of assistive products (1)
15. Outcome measure of assistive products (2)

Evaluation Criteria〉 Results will be evaluated through the lecture and reports submitted after each lesson.

Textbook〉 To be introduced in th class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125048/

Contact〉

⇒ Sueda (Eco705, +81-88-656-2167, osamu-sueda@eco.tokushima-u.ac.jp)
⇒ Fujisawa (ECO704, 656-7537, s-fuji@eco.tokushima-u.ac.jp)

Engineering on Circulation of Resources

Professor · Takahiro Hirotsu (2 units)

Target〉 Learning advanced technology for circulation of resouces

Outline〉 Separation and utilization of unused inorganic resources, separation of isotopes of light elements, and design and synthesis of adsorbents for separation of isotopes.

Style〉 Excercise

Keyword〉 recovery of resources, separation of materials, separation of isotopes

Goal〉 understanding of an advanced technology for circulation of resources

Schedule〉

1. What are resources?
2. Types and properties of substances
3. Separation of ions: ion-exchange method 1
4. Separation of ions: ion-exchange method 2
5. Separation of ions: ion-exchange method 3
6. Separation of ions: chelate exchange 1
7. Separation of ions: chelate exchange 2
8. Separation of ion: chelate exchange 3
9. Separation of isotopes by chemical-exchange method
10. Principle of separation of lithium-isotopes
11. Principle of separation fo boron-isotopes
12. Separation of isotopes by ion-exchange method 1
13. Separation of isotopes by ion-exchange method 2
14. Separation of isotopes by ion-exchange method 3
15. Separation of isotopes by ion-exchange method 4
16. Significance of advanced separation of substances in circulation of resources

Evaluation Criteria〉 Discussion in the class and description of ideas in the report

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125049/

Student〉 Able to be taken by only specified class(es)

Contact〉 Hirotsu (National Institute of Advanced Industrial Science and Technology, +81-87-869-3562, takahiro-hirotsu@aist.go.jp)

Advanced mitigation engineering

Professor · Hideki Ueshima (2 units)

Target〉 To obtain the abilities to find and solve environmental problems using for application of mitigation technique

Outline〉 To surveying of the latest news of mitigation and to understand its concept and examine the technique to mitigate the deterioration environment

Style〉 Lecture in combination with Portfolio

Keyword〉 District Improvement Plan for Disaster Mitigation, coastal environment

Fundamental Lecture〉 "Advanced Lecture in Social Risk Engineering"(1.0, ⇒404 page), "Advance Lecture of Political Simulation"(1.0, ⇒403 page)

Goal〉 To design and assess the mitigation plan for deterioration coastal environment

Schedule〉

1. Guidance of this subject
2. Current topics about mitigation 1
3. Current topics about mitigation 2
4. Current topics about mitigation 3
5. Current topics about mitigation 4
6. Current topics about mitigation 5
7. Current topics about mitigation 6
8. Current topics about mitigation 7
9. Current topics about mitigation 8
10. Current topics about mitigation 9
11. Current topics about mitigation 10
12. Discussion on research theme1
13. Discussion on research theme2
14. Discussion on research theme3
15. Presentation

Evaluation Criteria〉 Assignments count 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125050/

Contact〉 Ueshima (National Institute of Advanced Industrial Science and Technology, +81-823-72-1901, h-ueshima@aist.go.jp)

Advanced Exercise on Ecosystem Engineering

All teachers (2 units)

Target〉 To conduct research leading to the awarding of doctoral degrees.

Outline〉 To conduct research in Conversion Systems of Resource Energy, Resources Recycling Technology, Political Simulation, Social Risk Engineering, Design for Adapting the Environment Instead of the People and Engineering on Circulation of Resources.

Style〉 Portfolio, Lecture in combination with Portfolio, Lecture and excercise

Keyword〉 Ecosystem Engineering

Notice〉 Course plan differs depending on the laboratory you choose.

Goal〉 To present the results of your research related conferences, departmental research meetings, etc.

Schedule〉

1. After the student selects the subjects, research can be carried out at the laboratory.

Textbook〉 None

Reference〉 Using papers for each research field.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125051/

Student〉 Able to be taken by only specified class(es)

Advanced Research on Ecosystem Engineering

Teachers in other colleges or departments (2 units)

Target〉 To obtain broad information on recent engineering

Outline〉 To research a theme in a technology, which is different from the main technology in your field.

Keyword〉 Engineering, Technology, Different field

Goal〉 To learn a recent technology, which is different from the main technology in your field.

Schedule〉

1. Choose a thema on thechnology or engineering, which is different from that in your field.

Evaluation Criteria〉 Evaluated with portfolio or examination

Textbook〉 Ask to teachers

Reference〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125052/

Student〉 Able to be taken by only specified class(es)

Earth and Life Environmental Engineering — Ecosystem Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Human Factors ..... WEB page, CMS
  - Life Science ..... WEB page, CMS
  - Social Science ..... WEB page, CMS
  - Science and Technology Studies ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Presentation Method (D) ..... WEB page, CMS
  - Internship (D) ..... WEB page, CMS
  - Venture Business (D) ..... WEB page, CMS
- *Specialized Subjects*
  - Advanced Topics in Atoms and/or Molecules Manipulation ..... WEB page, CMS
  - Advanced conversion systems of resource energy ..... WEB page, CMS
  - Advance Lecture of Political Simulation ..... WEB page, CMS
  - Advanced Lecture in Social Risk Engineering ..... WEB page, CMS
  - Design for Adapting the Environment Instead of the Peop ..... WEB page, CMS
  - Engineering on Circulation of Resources ..... WEB page, CMS
  - Advanced mitigation engineering ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Exercise on Ecosystem Engineering ..... WEB page, CMS
  - Advanced Research on Ecosystem Engineering ..... WEB page, CMS

Systems Innovation Engineering

Systems Innovation Engineering — Electrical and Electronic Engineering
Syllabus of subjects

List of Subjects

Human Factors

Part-time Lecturer · Atsuya Yoshida (2 units)

Target〉 The objective of this class is to provide students with sufficiently thorough appreciation of the many facets of the human factors discipline so that they may make use of it to their own doctoral works.

Outline〉 This class offers a broad and comprehensive overview of the human factors/ergonomics discipline with four areas of emphasis, (1) historical review of human factors research, (2) human physical, perceptual and cognitive capabilities and limitations, (3) application of human factors research data in design, especially in the interface design of computer-based systems, and (4) discussion about the relationship between the designed system (technology) and people.

Schedule〉

1. What is Human Factors
2. Historical Overview of Human Factors
3. Multi-Disciplinary Aspect of Human Factors
4. Health and Safty Issue of Human Factors
5. Human Psychological Capability
6. Task Analysis
7. Human Error
8. Universal Design
9. Cognitive Artifact
10. Visibility and Affordance
11. Human-Computer Interaction
12. Human Information Processing
13. Knowledge and Mental Model
14. Usability Paradigms and Principles
15. Evaluation and Testing
16. Making system that makes us smart

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124976/

Life Science

Part-time Lecturer · Hiroshi Takagi, *Professor* · Akihiko Tsuji (2 units)

Target〉 Understanding of significance of protein in biotechnology

Outline〉 Basics of structure, function and application of protein are introduced

Style〉 Lecture

Keyword〉 Protein, Enzyme, Biotechnology

Goal〉

1. Understanding of multiple functions of proteins
2. Understanding of principle of protein engineering and its application

Schedule〉

1. Introduction of life science
2. History of life science
3. Structure and function of DNA and RNA
4. mRNA is a template of protein
5. Duplication of DNA
6. Regulation of protein expression
7. Human Genetics
8. Genetic disease
9. DNA diagnosis
10. Structure and function of protein
11. Principle of gene technology (1)
12. Principle of gene technology (2)
13. Protein engineering
14. Future of life science (1)
15. Future of life science (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124977/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Social Science

Part-time Lecturer · (2 units)

Target〉 The mutual relationship of economic activities, the structure and function of economic society, and the concept and technique of mathematical programming modelling are lectured.

Outline〉 Not only the mutual relationship of economic activities is explained from domestic and international points of view, but also the technique of case studies by application of mathematical programming models is tought using the various kinds of materials and examples.

Keyword〉 Economic activities, Structure and function, Mathematical programming model

Goal〉 To understand the mutual relationship of economic activities, empirically explain them using the mathematical programming model and evaluate the model.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of economic activities 1
3. Examples of economic activities 2
4. Examples of economic activities 3
5. Change in structure of economic society 1
6. Change in structure of economic society 2
7. Function of economic society 1
8. Function of economic society 2
9. Mutual relationship of economic activities 1
10. Mutual relationship of economic activities 2
11. Concept of mathematical programming model
12. Technique of model construction
13. Modelling of economic activities 1
14. Modelling of economic activities 2
15. Evaluation of modelling

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124978/

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Science and Technology Studies

Part-time Lecturer · (2 units)

Target〉 Let to learn the minimum essentials of science and technology studies and its function in contemporary society.

Outline〉 The science and technology studies deal with science and technology research and its outcomes by means of various methods of social science and humanities. The discipline emerged in 1930s when social importance of science and technology became evident. Since 1970s, the science and technology studies have developed as mission oriented learning for government policy, buisiness administrations and civic activity. students are expected to learn the outline of this discipline : the philosophy of science, history of science and technology, and sociology of science and technology, as well as their application to the problems in contemporary society since 1970s.

Style〉 Lecture

Goal〉

1. Understanding of the minimum essentials of the science and technology
2. Understanding of the social meaning of each student's research

Schedule〉

1. Introduction: A brief history of the science and technology studies since 1930s
2. Philosophical understanding of science: (1) Greek classics and scholastic study
3. Philosophical understanding of science: (2) Science study in Enlightenment and German Classics
4. Philosophical understanding of science: (3) Rise of the philosophy of science in the early twentieth century
5. Historical investigation of science and technology : (1) Emergence of the modern science
6. Historical investigation of science and technology : (2) technology in the Medieval West and the non -Western World
7. Historical investigation of science and technology : (3) Significance of the Industrial Revolution
8. Sociology of science and technology: (1) Normative structure and Paradigm
9. Sociology of science and technology: (2) Social constructivism and Laboratory life analysis
10. The 1950s model of science and technology policy in the Cold War
11. Innovation and Science and Technology
12. Knowledge industrial society since 1970s: (1) Environmental problem and energy prpblem
13. Knowledge industrial society since 1970s: (2) Computer science and Information society
14. Science and technology in the global economy since 1990s
15. Concluding remark: Science and technology in the future

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124979/

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124980/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124981/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Presentation Method (D)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124982/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (D)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal. (2)
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124983/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (D)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124984/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Topics in algebra and analysis

Professor · Shigeaki Nagamachi, *Associate Professor* · Hiroki Sumida-Takahashi (2 units)

Target〉 We will learn some important properties of a special function, which is called the Riemann zeta function. Further we will learn how to solve problems produced by this function.

Outline〉 We will learn developement of mathematical tools in order to prove some properties of the Riemann zeta function, such as the special values, Euler product and the functional equation.

Goal〉 We will learn fundamentals of modern abstract mathematics and realize its effectiveness.

Schedule〉

1. Introduction
2. The Riemann zeta function
3. Analytic continuation I
4. Analytic continuation II
5. The special values I
6. The special values II
7. Euler prodcut I
8. Euler prodcut II
9. The functional equation I
10. The functional equation II
11. The functional equation III
12. Algebraic numbers I
13. Algebraic numbers II
14. The special values and ideal class groups
15. Review

Evaluation Criteria〉 Evaluation will be based on assignments.

Reference〉 Dunham, William, "Euler: the Master of Us All", The Mathematical Association of America

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125054/

Contact〉 Sumida-Takahashi (A204, +81-88-656-7542, hiroki@pm.tokushima-u.ac.jp)Monday, 17:00-18:00

Radio Frequency Solid State Physics

Professor · Takashi Ohno, *Assistant Professor* · Koichi Nakamura (2 units)

Target〉 This class introduces basis of NMR and applications to studies on superconductivity, magnetism and ionic diffusion in solid.

Outline〉 The spectrum, spin-lattice relaxation, spin-spin relaxation, chemical shift etc., which are obtained by NMR measurements, are introduced and discussed in connection with various physical properties of solids.

Keyword〉 Nuclear Magnetic Resonance, Nuclear magnetic moment, Magnetism, Diffusion, Superconductor, Spin - lattice relaxation, Knight shift

Goal〉

1. To understand basis of NMR.
2. To understand relationship between various problems in solid state physics and relaxation phenomena observed using NMR.

Schedule〉

1. Introduction
2. Spin-echo and NMR spectrum
3. Equipments
4. Dipole interaction
5. Hyperfine interaction and spectrum
6. Chemical shift
7. Quadrupole interaction and quadrupole resonance
8. Spin-lattice relaxation
9. Internal magnetic field in ferro and antiferro magnets
10. Spin-lattice relaxation in metals
11. NMR studies on superconducting state
12. NMR studies on High Tc superconductors
13. Diffusion in solid and spin-lattice relaxation
14. NMR studies on lithium ionic conductors
15. NMR studies on protonic conductors
16. Summary

Evaluation Criteria〉 Report 100%

Textbook〉 遍歴電子系の核磁気共鳴 (朝山邦輔著, 裳華房)

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125055/

Contact〉

⇒ takashi Ohno (A201, 656-7549)
⇒ Nakamura (A216, +81-88-656-7577, koichi@pm.tokushima-u.ac.jp)

Engineering of Correlated Electron Matter

Professor · Yutaka Kishimoto, *Assistant Professor* · Yu Kawasaki (2 units)

Target〉 In many solid-state materials, new phenomena evolve due to strong electron interactions. In this Lecture, review will be given on some advanced topics and their applications, including high temperature superconductivity, metal-insulator transition and strongly correlated electronics.

Outline〉 New types of superconducting and magnetic phenomena emerge in correlated electron matters. The term "correlated electron" represents the state of matter where many electrons are strongly interacting with each other. After an introductory talk on magnetism and superconductivity, review will be given on some advanced topics, including high temperature superconductivity, metal-insulator transition and colossalmagneto resistance. Potential application of correlated electron matters to technology is also presented focusing on spintronics or strongly correlated electronics.

Style〉 Lecture

Keyword〉 strongly correlated electron systems, Mott insulator, colossalmagneto resistance, high temperature superconductor

Goal〉 To understand basic concepts of correlated electron matter and its application

Schedule〉

1. Introduction to correlated electron matters
2. Perspectives of magnetism and superconductivity in correlated electron matters
3. Electronic states of atoms and ions
4. Magnetic ions in crystal electric field
5. Introduction to superconductivity
6. How to probe rich properties in correlated electron matters
7. Mott insulator and metal-insulator transition
8. Spin, charge and orbital in transition metal oxides
9. Colossalmagneto resistance in transition metal oxides
10. Application of transition metal oxides with correlated electrons
11. High temperature superconductivity
12. Heavy-fermion superconductivity
13. Electronic states of organic conductors
14. Application of superconductors with correlated electrons
15. Towards strongly correlated electronics

Evaluation Criteria〉 Reports on several subjects in lecture.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125056/

Contact〉

⇒ Kishimoto (A202, +81-88-656-7548, yutaka@pm.tokushima-u.ac.jp)
⇒ Kawasaki (A217, +81-88-656-9878, yu@pm.tokushima-u.ac.jp)

Plasma Science and Technology

Professor · Kaoru Ohya (2 units)

Target〉 The lecture aims to understand electronic, atomic and molecular collision processes in gases and solids and to present their various applications.

Outline〉 1) Electronic, atomic and molecular collisions in gases and solid. Plasma physics and chemistry. Surface and materials science related to plasma-solid interactions. 2) Application to material processing technologies for electronic devices. Plasma-wall interactions in controlled thermonuclear fusion devices.

Style〉 Lecture in combination with Portfolio

Keyword〉 plasma, Collision theory, plasma-surface interaction, plasma applications

Goal〉

1. Understanding on collision processes in gases and solids
2. Understanding on applications to material processing technologies and plasma-wall interactions in controlled thermonuclear fusion devices.

Schedule〉

1. Introduction to collision theory
2. Interaction potential
3. Elastic collision and nuclear stopping power
4. Inelastic collision and electronic stopping power
5. Inelastic processes in gases
6. Electron and Ion transport in gases
7. Reflection and thermal re-emission from solids
8. Collision mixing and diffusions in solids
9. Physical sputtering and chemical sputtering
10. Plasma chemical vapor deposition deposition
11. Plasma-assisted etching
12. Other applications to material device processing
13. Plasma-wall interactions in nuclear fusion devices
14. Edge plasma physics
15. Hydrogen recycling and material erosion
16. Conclusions and future problems

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125057/

Contact〉 Ohya (, +81-88-656-7444, ohya@ee.tokushima-u.ac.jp)

Photonic Semiconductor Device Physics

Professor · Shiro Sakai, *Associate Professor* · Yoshiki Naoi, Katsushi Nishino (2 units)

Target〉 To understand the device physics and fabrication technique of photonic semiconductor devices..

Outline〉 Interaction of photons and electrons in semiconductors, physics of superlattice semiconductors and their applications as photonic devices. Crystal growth of semiconductors and heteroepitaxy.

Style〉 Lecture

Keyword〉 Semiconductor, Photonic device

Relational Lecture〉 "Optical and Functional Inorganic Materials"(0.5, ⇒427 page)

Goal〉

1. To understand device physics of photonic devices in terms of interaction of photons and electrons
2. To understand device physics of quantum effect devices
3. To understand crystal growth and related technologies for fabrication of photonic devices

Schedule〉

1. Introduction
2. Energy band structure of semiconductors
3. Quantum statistics of electrons in semiconductors
4. Carrier transport in semiconductors
5. Quantum devices and superlattice
6. Light absorption in semiconductors (interaction of electrons and photons)
7. Photocinductivity, photovol and photodiode
8. Physics of light emission of semiconductors
9. Radiative recombination, non-radiative recombination, stimulated emission and spontaneous emission
10. Light emitting diodes and lasers
11. Devices for optical communication
12. Crystal growth of substrates for photonic semiconductor devices
13. MOCVD and MBE
14. Fabrication of Ohmic contact
15. Nano-photonic devices and fabrication technology
16. Examination

Evaluation Criteria〉 Report 50%, Examination 50%. More than 60% is required to pass this class.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125058/

Contact〉

⇒ Sakai (, +81-88-656-7446, sakai@ee.tokushima-u.ac.jp)
⇒ Naoi (, +81-88-656-7447, naoi@ee.tokushima-u.ac.jp)
⇒ Nishino (, +81-88-656-7464, nishino@ee.tokushima-u.ac.jp)

Note〉 This lecture will be given in English.

Optical and Functional Inorganic Materials

Professor · Yasuo Ohno, *Associate Professor* · Kikuo Tominaga (2 units)

Target〉 This cource aims to learn the fundamentals of material science of such as single crystals, polycrystals or amorphous films for optical and functional materials. At the same time, the synthesis methods of various films, their evaluation techniques and the propagating optical beam and acoustic waves in crystals are lectured.

Outline〉 Fundamentals of crystal science is lectured at first. Optical and electronic processes in optical and functional materials such as single crystals, polycrystals or amorphous films are followed. Advanced solid state physics of semiconductors, dielectric and ferroelectric materials are included. Synthesis methods of optical and functional crystals and films, evaluation methods of film properties are also contained. Electro-optical and piezo-electrical effects and solid state physics relating with their effects, characterization of crystals, symmetry elements of crystals and material constants,optical properties of crystals, electro-optical effects and nonlinear effects, piezoelectricity, acoustic waves in crystal,interaction of phtons and phonons in crystal, synthesis methods of thin films (PVD method; electron beam evaporation, MBE, sputtering, laser ablation), film properties (charaterizations of electrical, optical and mechanical properties) are included.

Style〉 Lecture and excercise

Keyword〉 Functional material, semiconductor device, crystal optics, thin film technology, deposition techniques of thin films

Relational Lecture〉 "Photonic Semiconductor Device Physics"(0.5, ⇒426 page), "Nonlinear Optical Devices"(0.5, ⇒428 page)

Goal〉 Understanding of the solid state physics of piezoelectric materials and functional thin films

Schedule〉

1. Characterization of crystals
2. Symmetry elements of crystals and material constants 1
3. Symmetry elements of crystals and material constants 2
4. Optical properties of crystals 1
5. Optical properties of crystals 2
6. Electro-optical effects and nonlinear effects 1
7. Electro-optical effects and nonlinear effects 2
8. Piezoelectricity 1
9. Piezoelectricity 2
10. Acoustic waves in crystal 1
11. Acoustic waves in crystal 2
12. Interaction of phtons and phonons in crystal
13. Synthesis methods of thin films 1(PVD method; electron beam evaporation, MBE, sputtering, laser ablation)
14. Synthesis methods of thin films 2(PVD method; electron beam evaporation, MBE, sputtering, laser ablation)
15. Film properties (Charaterizations of electrical, optical and mechanical properties)
16. Exercise

Evaluation Criteria〉 Reports for each theme and examination

Textbook〉 Tomoya Ogawa:Fundamentals in Crystal Engineering, Shoukabou (in Japanese) and Shunichi Gonda, Applied Handbook of Thin Film Depositions, (NTS)(in Japanese)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125059/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Ohno (, +81-88-656-7438, ohno@ee.tokushima-u.ac.jp)
⇒ Tominaga (, +81-88-656-7439, tominaga@ee.tokushima-u.ac.jp)

Note〉 This lecture will be given in English.

Nonlinear Optical Devices

Professor · Masuo Fukui, *Associate Professor* · Masanobu Haraguchi (2 units)

Target〉 To understand the principle, tipical structure, advantages and disadvantages of current nonlinear optical devices. To develop ability to design new devices and solve verious problems for applications.

Outline〉 Physics of second-order and third-order nonlinear optical phenomena. Principles of electro-optics. Optical nonlinearities in fibers. Photorefractive materials. Nonlinear optical media. Anisotropic nonlinear optical media. Dispersive nonlinear optic media. Coupled-wave theory. Electro-optic and acousto-optic devices. Second-order and third-order nonlinear optic devices. Photonic switches. All-optical switches. Bistable optical devices. Optical connections.

Style〉 Portfolio

Keyword〉 nonlinear optics, harmonic generation, nonlinear optical device, optical switch

Relational Lecture〉 "Optical and Functional Inorganic Materials"(0.5, ⇒486 page), "Crystal Growth of Optical Materials"(0.5, ⇒481 page)

Requirement〉 Student should have fundamental knowledge of electromagnetic theory, waveoptics, optical properties of materials and lasers.

Notice〉 The following plan of this course is a example. Plans may be modified depending on knowledges and experiences of studens.

Goal〉

1. Possible to explain princiles, structure and characteristics of optoelectric devices.
2. Possible to explain princiles, structure and characteristics of the second-order nonlinear optical devices.
3. Possible to explain princiles, structure and characteristics of the third-order nonlinear optical devices.

Schedule〉

1. Introduction & interview
2. nonlinear optical phenomena
3. Electrooptic effect and its applications
4. Magnetooptic effect and its applications
5. Acoustoptic effect and its applications
6. principle of second-order nonlinear effects
7. Second-order nonlinear optical materials
8. Second-order nonlinear optical devices
9. principle of third-order nonlinear effects
10. third-order nonlinear optical materials
11. Third-order nonlinear devices
12. Experiment for nonlienar optical phenomena
13. Current application of nonlinear devices
14. Photonic crystal
15. Integrated optical devices

Evaluation Criteria〉 Activity:20%, reports:40% and oral examinations:40%

Textbook〉 After interview, we will decide suitable text books.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125060/

Contact〉

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⇒ Fukui (Opt.208, +81-88-656-9410, fukui@opt.tokushima-u.ac.jp)

Power System Electromagnetic Compatibility

Professor · Katsuo Isaka, *Associate Professor* · Naoyuki Shimomura, Masatake Kawada (2 units)

Target〉 1. To give the students understanding of the characteristics of electromagnetic compatibility in nature. 2. To give the students understanding of the characteristics of electromagnetic field generated from power system and the effect on biological system 3. To give the students understanding of the mechanisms of electromagnetic field generated from power system, the mitigation and the detection method. . 4. To improve the presentation skill of students by presenting the latest transaction or journal papers in this filed in English.

Outline〉 Characteristics of artificial electromagnetic fields of DC, extremely low frequency (ELF) and high frequency (HF) arising from power systems are quantitatively explained as well as those of the fields from natural environments. Prof. lsaka lectures mainly on characteristics of DC and ELF electric and magnetic fields produced by power lines and on their biological effects on humans. Associate Prof. Shimomura gives lectures on how the electromagnetic fields are produced by power systems and on the management (characterization, reduction & mitigation and public education) of ELF electric and magnetic fields.

Style〉 Lecture in combination with Portfolio

Keyword〉 Electrical power engineering, Electromagnetic compatibility, Bioelectromagnetics

Relational Lecture〉 "Advanced Theory of Electric Power Control Systems"(0.5, ⇒432 page)

Requirement〉 Understanding of electromagnetic compatibility

Goal〉

1. To understand the characteristics of electromagnetic compatibility in nature.
2. To understand the characteristics of electromagnetic field generated from power system and the effect on biological system
3. To understand the mechanisms of electromagnetic field generated from power system, the mitigation and the detection method. .

Schedule〉

1. EMC in nature 1 (Electric field)
2. EMC in nature 2 (Magnetic field)
3. Characteristics of power system EMC 1 (Electric field)
4. Characteristics of power system EMC 2 (Magnetic field)
5. Characteristics of low frequency electromagnetic field generated from power system 1
6. Characteristics of low frequency electromagnetic field generated from power system 2
7. Effect of low frequency electromagnetic field generated from power system on biological system 1
8. Effect of low frequency electromagnetic field generated from power system on biological system 2
9. Mechanisms of electromagnetic field generated from power system.
10. Coupling mechanisms of electromagnetic field and biological system
11. Analysis method between electromagnetic field and biological system
12. Social effects on electromagnetic field generated from power system
13. Mechanisms of the high frequency electromagnetic field generated from power system 1
14. Mechanisms of the high frequency electromagnetic field generated from power system 2
15. Method to detect the high frequency electromagnetic field generated from power system
16. Conclusion of power system EMC

Evaluation Criteria〉 Report 50%, Presentation 50%. More than 60% is required to pass this class.

Textbook〉 printed material

Reference〉

- ◇ D.F.Warne, Electrical Power Engineer's Handbook, Newnes
- ◇ J.Patrick Reilly, Applied Bioelectricity, Springer
- ◇ IEEE Trans on "Energy Conversion", "Power Delivery", "Electromagnetic Compatibility", and "Dielectrics and Electrical Insulation"

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125061/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)
⇒ Shimomura (, +81-88-656-7463, simomura@ee.tokushima-u.ac.jp)
⇒ Kawada (, +81-88-656-7460, kawada@ee.)Wednesday 16:00-17:00, Thursday16:00-17:00

Note〉 Language: English

Power Energy Conversion and Control Engineering

Professor · Tokuo Ohnishi (2 units)

Target〉 To investigate and learn new energy conversion and control technologies in the fields of the electric power system and the renewable energy.

Outline〉 Power electronics technologies in utility interconnection systems such as HVDC (High-Voltage Direct-Current) transmission system, SVG (Static Var Generator), UPS (Uninterruptible Power Supply) and FACTS (Flexible AC Transmission System) and in renewable energy development system such as photovoltaic, wind and fuel cell power generation system.

Keyword〉 Energy conversion, Energy control, Utility interconnection control system, Renewable energy

Fundamental Lecture〉 "Advanced Power Electronics"(0.5, ⇒209 page)

Requirement〉 Prerequisites:It is preferable to have knowledge equal with power electronics in undergraduate and advanced power electronics in masters degree course.

Goal〉

1. State of the Arts and Trends of The Utility Interconnection System using Power Electronics Technology
2. State of The Arts and Trends of The Renewable Energy Development using Power Electronics Technology

Schedule〉

1. Introduction od Power Electronics Technology in Utility Interconnection System
2. High Voltage Direct Current Transmission System
3. Flexible AC Transmission System
4. Static Var Generator
5. Unified Power Flow Controller
6. Uninteruptible Power Supply
7. INtroduction of Power Electronics Technology in Renewable Energy
8. Photovoltaic Power Generation System
9. Wind Power Generation System
10. Micro Gas Turbine System
11. Fuel Cell System
12. Charging and Discharging System for DC Battery
13. Hybrid Power Supply System
14. Distributed Generation System
15. Discussion for Reports

Evaluation Criteria〉 Report and presentation

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125062/

Contact〉 Ohnishi (, +81-88-656-7456, ohnishi@ee.tokushima-u.ac.jp)

Applied Superconductivity

Professor · Kiyoshi Inoue (2 units)

Target〉 As concerned with superconducting technology of which applications are beginning, superconducting physics, superconducting materials, superconducting applications, and cryogenic engineering are lectured in order to understand synthetically the applied superconductivity.

Outline〉 A macroscopic quantized effect; i. d. superconducting phenomenon, has many singular properties, such as complete diamagnetism, perfect zero-resistance, and fruxoid (flux quantization). Therefore in order to improve the efficiency of energy conversion and the sensitivity of measurement many superconducting applications were being progressed. On the other hand, the superconductivity appeared only at very low temperatures, which was a large obstacle to applications. However the recent great progress in cryogenic engineering and the discovery of high Tc superconductors brought the superconducting applications more easily. New practical applications were also beginning. Superconducting physics, practical superconducting materials, fabrication processes of superconducting cable, stabilization of superconducting cable, design of superconducting magnet, protection of superconducting magnet, cryogenic refrigeration engineering, cryogenic thermal insulation technology, superconducting applications, SQUID applications are lectured in technological situations in order to understand synthetically the applied superconductivity.

Style〉 Lecture in combination with Portfolio

Keyword〉 Superconductivity, Superconducting Applications, Superconducting Materials, Cryogenics

Relational Lecture〉 "Engineering of Correlated Electron Matter"(0.5, ⇒424 page)

Requirement〉 Understanding of electromagnetism and material science.

Goal〉

1. Understanding technological merit and demerit of superconducting physical properties
2. Understanding physical backgraund of superconductivity and possibility of superconducting materials
3. Understanding superconducting applications and their possibility

Schedule〉

1. Superconducting Physics I
2. Superconducting physics II
3. Metallurgical superconducting materials.
4. Oxide and other type high Tc superconducting materials.
5. Flux jump and stabilization of superconducting cable.
6. Fabrication prosesses of superconducting metallurgical wires.
7. Fabrication processes of oxide and other type superconducting wires.
8. Fabrication technology of superconducting wire and supporting technology.
9. Cryogenic refrigeration, fabrication technology of cryogen, and physical properties of cryogen
10. Cryogenic Dewar, cryogenic thermal insullation, and cooling methods.
11. Superconducting applications for energy saving.
12. Superconducting applications for medical diagnosis and for preserving enviroment.
13. Superconducting applications for magrev train, fusion reactor, and accelarator.
14. Problems of oxide superconductors for practical applications.
15. Applications of SQUID.
16. Presentation by report

Evaluation Criteria〉 Report 50%, Presentation 50%, Higher than 60% is required to pass this class

Textbook〉

- ◇ Superconducting Technology (in Japanese)
- ◇ Superconducting Materials (in Japanese)
- ◇ Introduction to Superconductivity, by Michael Tinkham, McGraw-Hill Inc.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125063/

Student〉 Able to be taken by only specified class(es)

Contact〉 Inoue (B-7, +81-88-656-7462, inouek@ee.tokushima-u.ac.jp)Monday 13:30 - 17:30, Wednesday 13:30 - 17:30

Advanced Theory of Electric Power Control Systems

Part-time Lecturer · Kensuke Kawasaki, · Kiyoshi Takigawa (2 units)

Target〉 The purpose of this lecture is to understand the characteristic of various power generation systems and electric power systems and to master new technologies on distributed power sources and electric power systems.

Outline〉 The principle of power generation in various kinds of power generation machines, the characteristic of electric power systems and the analysis technique are introduced. Moreover, the electric power control technology for a distributed power source using an inverter, and control techniques in electric power systems connecting power generation facilities whose output change will occur, such as solar systems, are introduced.

Style〉 Portfolio

Keyword〉 electric power control, solar system, inverter

Requirement〉 N/A

Goal〉

1. To master analysis technique of power generation systems
2. To master analysis techniques of electric power systems
3. To understand control mechanism of distributed power generation systems
4. To maseter analysis techniques of distributed power generation systems

Schedule〉

1. Energy transformation technique
2. Basic circuit equations for electric power systems
3. Analysis method 1 in electric power systems
4. Analysis method 2 in electric power systems
5. Analysis method 3 in electric power systems
6. Voltage and reactive power in electric power systems
7. Modeling of synchronous machines
8. Characteristics of synchronous machines
9. Modeling of distributed power generation systems
10. Stability of electric power systems
11. Control of electric power systems
12. Control of distributed power generation systems
13. Requirements for stability in distributed power generation systems
14. Advances analysis method 1 in electric power systems
15. Advances analysis method 1 in electric power systems
16. Examination

Evaluation Criteria〉 Evaluate with portfolio and examinations

Textbook〉 printed materials

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125064/

Advanced Mechatronics Engineering

Professor · Takuya Kamano, *Associate Professor* · Ikuro Morita, Takashi Yasuno (2 units)

Target〉 This class introduces the basic principle of the diagnosis technology and the control technique of the industrial machine system that uses an electric actuator.

Outline〉 The objective of this lecture is to give a course on the modeling methods, the sensor techniques, the signal processing methods, the intelligent control algorithms for industrial machines driven by electrical actuators. The applications of these advanced schemes are also included.

Style〉 Lecture in combination with Portfolio

Keyword〉 Diagnosis Technology, Control Algorithm, Intelligent

Relational Lecture〉 "Control System Design"(0.5, ⇒440 page), "Power Energy Conversion and Control Engineering"(0.5, ⇒430 page)

Goal〉

1. The modeling, the sensor technology, and the diagnosis technology of the control system are introduced.
2. Improvement performances of control system, and Control algorithm for intelligent are introduced.

Schedule〉

1. Sensor technology for fauilure diagnosis.
2. Signal processing technology for failure diagnosis.
3. Modeling method of electrical machines.
4. Modeling method of electrical machines on faulty conditions.
5. Characteristics of electrical machnes on faulty conditions.
6. Intelligent control method
7. Fuzzy reasoning
8. Control system using fuzzy reasoning
9. Neural networks
10. Control system using neural networks
11. Motion control system
12. Two degree-of-freedom control system
13. Design method of feedback controller for disturbance suppression
14. Design method of feedforward controller for Improvement of responses
15. Responses of two degree-of-freedom control system
16. Return of report, and conclusions

Textbook〉 The print is distributed.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125065/

Contact〉

⇒ Kamano (, +81-88-656-7455, kamano@ee.tokushima-u.ac.jp)
⇒ Morita (, +81-88-656-7451, morita@ee.tokushima-u.ac.jp)
⇒ Yasuno (, +81-88-656-7458, yasuno@ee.tokushima-u.ac.jp)

Communication Systems

Professor · Tadamitsu Iritani, *Assistant Professor* · Takahiro Oie (2 units)

Target〉 Understanding the designing and administrating scheme of wireless communication system and multi-nodes networks. And bring up faculty of designing original telecommunication system.

Outline〉 Timing detection and regeneration of a phase and a frequency using a linear filter, design of a digital PLL, digital modulation and demodulation, and multiple access technique, e. g. FDMA, TDMA, CDMA in wireless communications. Design of the spread spectrum systems and its fundamental technologies, e. g. frequency-synthesizer, data transmission protocol over computer networks, network administration techniques, e. g. DNS, and implementation of application program for internetworking.(Portfolio style)

Style〉 Portfolio

Keyword〉 Spread Spectrum, Phase Locked Loop, Frequency Synthesizer, Computer Networks, Network Architecture, Network Administration

Fundamental Lecture〉 "Advanced Theory of Electrical Communication"(1.0, ⇒212 page)

Requirement〉 Students are required to have a good understanding of communication engineering and related subjects up to master-level.

Goal〉

1. Able to design the multiple-access wireless communication system (e.g. FDMA, TDMA, CDMA).
2. Able to design the network architecture which satisfies the specified demands on multi-nodes network (e.g. computer networks).

Schedule〉

1. Timing detection and regeneration of a phase
2. Phase-locked loops and its components
3. Response to linear frequency variation
4. All digital phase-locked loops
5. The PLL in communications
6. Digital modulation and demodulation
7. Mobile communication system (FDMA, TDMA, CDMA)
8. Transmission protocol of computer networks (Ethernet, ATM)
9. Transmission protocol of computer networks (TCP, UDP)
10. Network administration technique (DNS)
11. Network administration technique (SNMP, MIB)
12. Implementation of network application
13. Designing the application protocol
14. Distributed database system
15. Designing the distributed system

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125066/

Student〉 Able to be taken by only specified class(es).

Contact〉

⇒ Iritani (, +81-88-656-7478, iritani@ee.tokushima-u.ac.jp)
⇒ Oie (E-3F-C-1, +81-88-656-7479, alex@ee.tokushima-u.ac.jp)Monday 16:20~ 17:20, Thursday 16:50~ 17:50

Integrated System Design

Professor · Shinsuke Konaka (2 units)

Target〉 High frequency design method and theory for GHz/Gbit high speed integrated circuits are lectured and discussed.

Outline〉 High frequency circuit design methodology using circuit simulator and 3D electromagnetic simulator is lectured by using high speed bipolar/MOS transistor parameters and high frequency circuit models of wire, poly-silicon resistor, MIM capacitor and spiral inductor.

Style〉 Lecture and excercise

Keyword〉 RF analog circuit design, AC device parameters, High frequency integrated circuits

Relational Lecture〉 "Integrated System Design"(0.5, ⇒435 page)

Goal〉

1. To understand high frequency circuit models of transistor, wire, resistor, MIM capacitor and spiral inductor.
2. To understand high frequency circuit design and measurement.

Schedule〉

1. Bipolar/MOS transistor device models
2. AC equivalent circuit models of a wire, resistor, MIM capacitor and spiral inductor
3. S parameter measurements and AC device parameter extractions
4. High frequency stability design
5. Case studies of high frequency integrated circuits

Evaluation Criteria〉 Report 100%. The passing mark is not less than 60%.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125067/

Contact〉 Konaka (, +81-88-656-7469, konaka@ee.tokushima-u.ac.jp)

Electronic Information System Design

Professor · Masaki Hashizume, *Associate Professor* · Hiroyuki Yotsuyanagi (2 units)

Target〉 This class introduces the techniques and the recent topics related to the design and test of logic circuits.

Outline〉 Performance analysis methods of digital circuits in information systems, high speed logic circuit design, low power circuit design and optimized logic circuit design for high performance information system, testing and testable design of digital and analog circuits for realizing high reliable information system.

Style〉 Lecture in combination with Portfolio

Keyword〉 system design for integrated circuits, testing of integrated circuits, synthesis for testability

Fundamental Lecture〉 "Advanced Theory of Electronic Circuits"(1.0, ⇒215 page)

Relational Lecture〉 "Integrated Information System Design"(0.5, ⇒438 page), "Integrated System Design"(0.2, ⇒435 page)

Requirement〉 Familiarity with switching theory

Goal〉

1. To understand system design techniques for integrated circuits
2. To understand test technologies for integrated circuits
3. To understand design for testability techniques for integrated circuits

Schedule〉

1. compsitions of information systems
2. design process of logic circuits
3. logic synthesis for combinational circuits
4. design process of sequential circuits
5. principle of dynamic logic circuits
6. design of dynamic logic circuits
7. hardware description language
8. circuit design using HDL
9. test process of logic circuits
10. test technologies for combinational logic circuits
11. test technologies for sequential logic circuits
12. design for testability
13. test technologies using design for testability
14. techniques of design for testability
15. Built-in self test for logic circuits
16. Final examination

Evaluation Criteria〉 Participation and presentation:30%; Final examination:70%

Textbook〉 specified in the first class

Reference〉 introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125068/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Hashizume (, +81-88-656-7473, tume@ee.tokushima-u.ac.jp)
⇒ Yotsuyanagi (, +81-88-656-9183, yanagi4@ee.tokushima-u.ac.jp)

Note〉 This subject will be given in English.

Multimedia Communication Theory and Technology

Assistant Professor · Masami Mohri, *Professor* · Seishi Kitayama, *Assistant Professor* · Hitoshi Tokushige (2 units)

Target〉 This class provides the knowledge necessary to understand fundamental technics for multimedia information and communication systems, such as coding method of multimedia data, information security, network security, user authentication, cryptology

Outline〉 This lecture is focused on multimedia communication theory and technology. Particulary, Internet Technology, Computer Networks, Satellite Communications, Information Security and Cryptology, Multimedhia Coding Theory and Its Applications are explained in this lecture.

Style〉 Lecture

Keyword〉 Internet Technology, Computer Networks, Satellite Communications, Information Security, Multimedhia Coding Theory

Fundamental Lecture〉 "Advanced Exercise on Intelligent Science"(1.0, ⇒465 page)

Requirement〉 特になし

Goal〉

1. fundamental technics for multimedia information and communication systems can be learned
2. Development method for multimedia information and communication systems can be learned

Schedule〉

1. Multimedia Communication Theory and Technology
2. Coding Theory for Multimedia data (1)
3. Coding Theory for Multimedia data (2)
4. Coding Theory for Multimedia data (3)
5. Digital data Transmission (1)
6. Digital data Transmission (2)
7. Cryptology (1)
8. Cryptology (2)
9. Cryptology (3)
10. Information Security
11. Network Security (1)
12. Network Security (2)
13. Contents Protection for Maltimedia Data
14. User Authentication
15. Digital Signature
16. Assignment

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 Printed synopsises of lecture are distributed.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125069/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Mohri (C301, +81-88-656-7487, mmohri@is.tokushima-u.ac.jp)Monday 15:00–18:00
⇒ Kitayama (, +81-88-656-7482, kitayama@ee.tokushima-u.ac.jp)
⇒ Tokushige (C303, +81-88-656-9447, tokusige@is.tokushima-u.ac.jp)

Integrated Information System Design

Professor · Norio Akamatsu, Minoru Fukumi, *Associate Professor* · Takashi Shimamoto (2 units)

Target〉 The aim of this lecture is to master the modern design technologies of very large scale integrated circuits.

Outline〉 Very large scale integrated circuit (V-LSI) design and production method. Using CAD technology, VLSI logic design, testing and fabrication are explained. Design of high-speed algorithm and parallel distributed processing system. Neural network and genetic algorithm for integrated circuit design.

Style〉 Lecture and excercise

Requirement〉 It is necessary to get the unit of the mos integrated circuits in master cource.

Notice〉 In order to get the unit of this lecture, the grduate cource students should have learned the-state-of-the-art of the modern hardware technology, especially C-MOS integrated circuits.

Goal〉 This lecture is desighned to provide engineers and scientists with an introduction to the fieled of VLSI neurocomputing.

Schedule〉

1. Embedded software architecture
2. Real-time schedure method
3. System description language
4. Application specific integrated circuits
5. Power consumption and speed of very large scale integrated circuits
6. Shared memory and communication mrthod
7. Cash memory and main memory
8. System modeling and documentation
9. Partitioning and performance
10. deta flow graph and finite state machine
11. Behavior description language and Spec C
12. Control deta-flow graph and function synthesis
13. Neural computing board diagram using EEPROM-style programmable synapses
14. Layout patern example
15. Gate-sizing wiring and timing driven
16. Boundary scan and delay estimation

Evaluation Criteria〉 Unit evaluation contains test and design of VLSI

Textbook〉 Hardware Annealing in Analog VLSI Neurocomputing, Kluer Academic Publishers

Reference〉 Electronics Circuits, written by Norio Akamatsu

Webpage〉 http://www.A3.is.tokushima-u.ac.jp

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125070/

Student〉 Able to be taken by student of other department and faculty

Contact〉 Akamatsu (D209, +81-88-656-7493, akamatsu@is.tokushima-u.ac.jp)on Wednesday afternoon

Note〉 Lecturer will show the schedule of this lecture and design technologies.

Advanced Nonlinear Circuit Technology

Associate Professor · Yoshifumi Nishio (2 units)

Target〉 Nonlinear circuits technology is lectured.

Outline〉 Various nonlinear circuits from communication circuits such as oscillators and modulators to large scale analog circuits including neural networks are utilized in recent technology. In this course, analysis methods, design methods and simulation methods of these nonlinear circuits are lectured. Furthermore, recent development of nonlinear circuit technology is introduced and future applications are discussed. (Style: Lecture)

Style〉 Lecture and excercise

Keyword〉 Nonlinear circuits, Neural network, Chaotic circuits

Fundamental Lecture〉 "Advanced Circuit Theory"(0.7, ⇒214 page), "Advanced Theory of Complex System Engineering"(0.5, ⇒190 page), "Advanced Theory of System Analysis"(0.5, ⇒211 page)

Relational Lecture〉 "Nonlinear System Design"(0.5, ⇒441 page)

Requirement〉 Students are required to know how to analyze basic linear circuits.

Notice〉 Course is taught in English.

Goal〉

1. Understanding of importance of nonlinear circuit technology.
2. Learning of technique dealing nonlinear circuit technology.

Schedule〉

1. Nonlinear circuits in engineering systems.
2. Oscillators.
3. Communication circuits.
4. Neural networks.
5. Chaotic circuits.
6. Ultra-high speed integrated circuits.
7. Analysis of nonlinear circuits.
8. Design of nonlinear circuits.
9. Simulation methods of nonlinear circuits.
10. Recent development of nonlinear circuits (for 2 lectures).
11. Future applications of nonlinear circuits (for 3 lectures).
12. Conclusions.
13. Final examination.

Evaluation Criteria〉 Final examination 80% and exercise 20%.

Textbook〉 None.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125071/

Student〉 Able to be taken by only specified class(es)

Contact〉 Nishio (D-7, E-3F-South, +81-88-656-7470, nishio@ee.tokushima-u.ac.jp)

Control System Design

Associate Professor · Tomohiro Kubo (2 units)

Target〉 To learn the control theory, mainly the robust control.

Outline〉 When a control system is synthesized, it is important to take the uncertainty of the plant model and the disturbances into account. The design methods to obtain robust control systems against these effects are demonstrated.(lecture or portfolio style)

Style〉 Lecture in combination with Portfolio

Keyword〉 robust control

Fundamental Lecture〉 "Advanced Control Theory"(1.0, ⇒210 page)

Relational Lecture〉 "Advanced Control Theory"(0.5, ⇒210 page)

Requirement〉 Knowledge about the control system design method based on the state space method and the transfer function method is required to attend this lecture.

Notice〉 Preparation is essential.

Goal〉

1. Mastering the classical robust control.
2. Mastering the H∞ control.

Schedule〉

1. What is the robust control?
2. Stability of linear systems
3. Sensitivity
4. Expression of uncertainty
5. Quadratic stabilization
6. Stability margin of LQ regulator
7. Insensitivity of LQ regulator
8. Review of the first half
9. Singular value and H∞ norm
10. Robust stabilization
11. Sensitivity reduction
12. Standard H∞ problem
13. Solution (state feedback)
14. Solution (output feedback)
15. Review of the second half
16. Grand review

Evaluation Criteria〉 Mainly by the report.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125072/

Contact〉 Kubo (, +81-88-656-7466, kubo@ee.tokushima-u.ac.jp)

Nonlinear System Design

Executive Director · Hiroshi Kawakami, *Associate Professor* · Tetsushi Ueta (2 units)

Target〉 For various nonlinear phenomena observed in physical, chemical, and biological systems, construction methodologies of numerical models describing their dynamical behavior are discussed. Analysis and design methods are also studied.

Outline〉 Analysis and design of nonlinear dynamical systems are discussed: 1) description and characterization of dynamical systems, 2) qualitative theory of ordinary differential equations, 3) numerical method of analysis, 4) analysis of chaotic states and bifurcations 5) controlling chaos. Typical nonlinear phenomena are illustrated and analyzed by qualitative and numerical methods. Nonlinear system design problems are also discussed.

Style〉 Lecture

Keyword〉 nonlinear dynamical system, bifurcation, system design

Fundamental Lecture〉 "Advanced Theory of Complex System Engineering"(1.0, ⇒190 page), "Topics of Analysis for Mathematical Science"(1.0, ⇒232 page), "Advanced Circuit Theory"(1.0, ⇒214 page)

Relational Lecture〉 "Control System Design"(0.5, ⇒440 page), "Advanced Nonlinear Circuit Technology"(0.5, ⇒439 page)

Requirement〉 None

Notice〉 A lecture "Advanced Theory of Complex System Engineering," available for the Master's course is mutually cooperated with this lecture.

Goal〉 acquisition of techniques for deriving model equations and proceeding bifurcation analyses.

Schedule〉

1. Introduction to dynamical systems
2. Fixed points, equilibria and their stability
3. Periodic solution and its stability
4. Analytic approaches for periodic solutions
5. Numerical approaches for periodic solutions
6. Local bifurcations
7. Calculation of bifurcation parameter values
8. Global bifurcations and its numerical analysis
9. Deriving model equations 1
10. Deriving model equations 2
11. Symmetry and its applications to calculations
12. Various bifurcation phenomena and chaos
13. Existence and numerical indices for chaos
14. practice 1
15. practice 2
16. answers and survey

Evaluation Criteria〉 The total grade is evaluated by homework reports (70 %) and attendance of the class. (30 %)

Textbook〉 not specified.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125073/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Kawakami (, +81-88-656-7465, hukugakk@honbu.tokushima-u.ac.jp)
⇒ Ueta (Ait502, +81-88-656-7501, tetsushi@ait.tokushima-u.ac.jp)

Note〉 This lecture will be given in English.

Medical and Biological Engineering

Professor · Yohsuke Kinouchi, *Assistant Professor* · Masatake Akutagawa (2 units)

Target〉 Various applications of electronic technologies to medical fields are decsribed.

Outline〉 Fundamental approaches to apply engineering such as electronics to medical fields including diagnosis, treatment and alternative function are described in relation to life sciences such as physiology, biomechanics and so forth. Typical systems of medical instruments are introduced. The development of new technologies based on the intelligent functions of living bodies are presented. Functional characteristics of the nervous system and their application to information processing and control are discussed.

Style〉 Lecture in combination with Portfolio

Goal〉 1 Biological signal measurement 2 Biological signal processing 3 Medical systems

Schedule〉

1. Introduction of medical engineering
2. Introduction of measurement of biological signal
3. Electrical measurement methods
4. Magnetic measurement methods
5. Ultrasonic measurement methods
6. Other measurement methods
7. Biological signal processing methods
8. Examples of biological signal processing
9. Biological system identification
10. Measurement of brain functions
11. Measurement of other functions
12. Biological monitor
13. Analysis of electrical properties of tissue
14. Examples of medical diagnosis technology
15. Examples of medical treatment technology
16. Medical prosthesis technology

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125074/

Contact〉

⇒ Kinouchi (, +81-88-656-7475, kinouchi@ee.tokushima-u.ac.jp)

⇒ Akutagawa (, +81-88-656-7477, makutaga@ee.tokushima-u.ac.jp)Wed. 17:00 - 18:00, Fri. 17:00 - 18:00

Note〉 This lecture will be given in English.

Medical Information Systems

Professor · Noboru Niki, *Associate Professor* · Yoshiki Kawata (2 units)

Target〉 To understand the fundamental concepts of digital environment for medical diagnosis. To learn the design methods of medical information systems.

Outline〉 This course introduces the design and the implementation of digital environment for medical diagnosis based on the various technologies including medical image data acquisition and retrieval, computer aided diagnosis using multimodal medical data sets.

Style〉 Portfolio

Keyword〉 Imaging technology, Computed-aided diagnosis systems, Digital environment for medical diagnosis

Relational Lecture〉 "Medical and Biological Engineering"(0.5, ⇒487 page)

Goal〉

1. To understand medical imaging techniques.
2. To understand various techniques of computer-aided diagnosis.
3. To understand the fundamentals of digital environment for medical diagnosis.

Schedule〉

1. Introduction
2. Imaging techniques
3. Image processing techniques
4. Pattern recognition techniques
5. Visualization techniques
6. Virtual reality/Mixed reality techniques
7. Design of computer-aided diagnosis systems
8. Implementation of computer-aided diagnosis systems
9. Design and implementation of fundamentals of digital environment for medical diagnosis and therapy
10. Design of medical information systems (1)
11. Design of medical information systems (2)
12. Design of medical information systems (3)
13. Design of medical information systems (4)
14. Design of medical information systems (5)
15. Advanced medical information systems

Evaluation Criteria〉 Report 100%

Textbook〉 Reference books are introduced to each topics.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125075/

Contact〉

⇒ Niki (Opt.507, +81-88-656-9430, niki@opt.tokushima-u.ac.jp)
⇒ Kawata (Opt.508, +81-88-656-9431, kawata@opt.tokushima-u.ac.jp)

Special Excercise on Electrical and Electronic Systems Innovation Engineering

All teachers (2 units)

Target〉 To obtain wide knowledge on electric and electronic engineering and research skills.

Outline〉 To make research on your research topics with your adviser through discussions and readings of references.

Style〉 Portfolio

Keyword〉 research skill, Acquisition of professional knowledge

Requirement〉 none

Notice〉 none

Goal〉

1. To obtain professional knowledege on your research topics
2. To get research skills
3. To get presentation skills

Schedule〉

1. Determine your reasearch topics
2. Read references on your research topics
3. Make research
4. Presentation and discussion

Evaluation Criteria〉 Evaluation with portfolio and examination

Textbook〉 Text books will be introduced by your supervisor at the beginning of this excersise.

Reference〉 References may be introduced by your supervisor.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125076/

Student〉 Able to be taken by only specified class(es)

Advanced Research on Electrical and Electronic Engineering

All teachers (2 units)

Target〉 To obtain wide knowledge on recent engineering
Outline〉 To make research on a technology, which is different from your main research field.
Style〉 Portfolio
Keyword〉 Engineering, technology, different field
Requirement〉 N/A
Notice〉 N/A
Goal〉 To learn a recent technology, which is different from the main technology in your field
Schedule〉
1. Choose a research theme on technology or engineeing, which is different from yours.

Evaluation Criteria〉 Evaluate with a portfolio and/or examinations.
Textbook〉 Ask to teachers
Reference〉 printed materials
Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125077/
Student〉 Students belonging an other departments or colleges

Systems Innovation Engineering — Electrical and Electronic Engineering
Web page and CMS related subject

- *Integrated Subjects*

  Human Factors ..... WEB page, CMS
  Life Science ..... WEB page, CMS
  Social Science ..... WEB page, CMS
  Science and Technology Studies ..... WEB page, CMS
  Management Theory of New Business ..... WEB page, CMS
  Introduction to Intellectual Property ..... WEB page, CMS
  Presentation Method (D) ..... WEB page, CMS
  Internship (D) ..... WEB page, CMS
  Venture Business (D) ..... WEB page, CMS

- *Specialized Subjects*

  Topics in algebra and analysis ..... WEB page, CMS
  Radio Frequency Solid State Physics ..... WEB page, CMS
  Engineering of Correlated Electron Matter ..... WEB page, CMS
  Plasma Science and Technology ..... WEB page, CMS
  Photonic Semiconductor Device Physics ..... WEB page, CMS
  Optical and Functional Inorganic Materials ..... WEB page, CMS
  Nonlinear Optical Devices ..... WEB page, CMS
  Power System Electromagnetic Compatibility ..... WEB page, CMS
  Power Energy Conversion and Control Engineering ..... WEB page, CMS
  Applied Superconductivity ..... WEB page, CMS
  Advanced Theory of Electric Power Control Systems ..... WEB page, CMS
  Advanced Mechatronics Engineering ..... WEB page, CMS
  Communication Systems ..... WEB page, CMS
  Integrated System Design ..... WEB page, CMS
  Electronic Information System Design ..... WEB page, CMS
  Multimedia Communication Theory and Technology ..... WEB page, CMS
  Integrated Information System Design ..... WEB page, CMS
  Advanced Nonlinear Circuit Technology ..... WEB page, CMS
  Control System Design ..... WEB page, CMS
  Nonlinear System Design ..... WEB page, CMS
  Medical and Biological Engineering ..... WEB page, CMS
  Medical Information Systems ..... WEB page, CMS

- *Specialized Exercise and Experiments*

  Special Excercise on Electrical and Electronic Systems Innovation Engineering ..... WEB page, CMS
  Advanced Research on Electrical and Electronic Engineering ..... WEB page, CMS

Systems Innovation Engineering — Information Science and Intelligent Systems
Syllabus of subjects

List of Subjects

Human Factors

Part-time Lecturer · Atsuya Yoshida (2 units)

Target〉 The objective of this class is to provide students with sufficiently thorough appreciation of the many facets of the human factors discipline so that they may make use of it to their own doctoral works.

Outline〉 This class offers a broad and comprehensive overview of the human factors/ergonomics discipline with four areas of emphasis, (1) historical review of human factors research, (2) human physical, perceptual and cognitive capabilities and limitations, (3) application of human factors research data in design, especially in the interface design of computer-based systems, and (4) discussion about the relationship between the designed system (technology) and people.

Schedule〉

1. What is Human Factors
2. Historical Overview of Human Factors
3. Multi-Disciplinary Aspect of Human Factors
4. Health and Safty Issue of Human Factors
5. Human Psychological Capability
6. Task Analysis
7. Human Error
8. Universal Design
9. Cognitive Artifact
10. Visibility and Affordance
11. Human-Computer Interaction
12. Human Information Processing
13. Knowledge and Mental Model
14. Usability Paradigms and Principles
15. Evaluation and Testing
16. Making system that makes us smart

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124976/

Life Science

Part-time Lecturer · Hiroshi Takagi, *Professor* · Akihiko Tsuji (2 units)

Target〉 Understanding of significance of protein in biotechnology

Outline〉 Basics of structure, function and application of protein are introduced

Style〉 Lecture

Keyword〉 Protein, Enzyme, Biotechnology

Goal〉

1. Understanding of multiple functions of proteins
2. Understanding of principle of protein engineering and its application

Schedule〉

1. Introduction of life science
2. History of life science
3. Structure and function of DNA and RNA
4. mRNA is a template of protein
5. Duplication of DNA
6. Regulation of protein expression
7. Human Genetics
8. Genetic disease
9. DNA diagnosis
10. Structure and function of protein
11. Principle of gene technology (1)
12. Principle of gene technology (2)
13. Protein engineering
14. Future of life science (1)
15. Future of life science (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124977/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Social Science

Part-time Lecturer · (2 units)

Target〉 The mutual relationship of economic activities, the structure and function of economic society, and the concept and technique of mathematical programming modelling are lectured.

Outline〉 Not only the mutual relationship of economic activities is explained from domestic and international points of view, but also the technique of case studies by application of mathematical programming models is tought using the various kinds of materials and examples.

Keyword〉 Economic activities, Structure and function, Mathematical programming model

Goal〉 To understand the mutual relationship of economic activities, empirically explain them using the mathematical programming model and evaluate the model.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of economic activities 1
3. Examples of economic activities 2
4. Examples of economic activities 3
5. Change in structure of economic society 1
6. Change in structure of economic society 2
7. Function of economic society 1
8. Function of economic society 2
9. Mutual relationship of economic activities 1
10. Mutual relationship of economic activities 2
11. Concept of mathematical programming model
12. Technique of model construction
13. Modelling of economic activities 1
14. Modelling of economic activities 2
15. Evaluation of modelling

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124978/

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Science and Technology Studies

Part-time Lecturer · (2 units)

Target〉 Let to learn the minimum essentials of science and technology studies and its function in contemporary society.

Outline〉 The science and technology studies deal with science and technology research and its outcomes by means of various methods of social science and humanities. The discipline emerged in 1930s when social importance of science and technology became evident. Since 1970s, the science and technology studies have developed as mission oriented learning for government policy, buisiness administrations and civic activity. students are expected to learn the outline of this discipline : the philosophy of science, history of science and technology, and sociology of science and technology, as well as their application to the problems in contemporary society since 1970s.

Style〉 Lecture

Goal〉

1. Understanding of the minimum essentials of the science and technology
2. Understanding of the social meaning of each student's research

Schedule〉

1. Introduction: A brief history of the science and technology studies since 1930s
2. Philosophical understanding of science: (1) Greek classics and scholastic study
3. Philosophical understanding of science: (2) Science study in Enlightenment and German Classics
4. Philosophical understanding of science: (3) Rise of the philosophy of science in the early twentieth century
5. Historical investigation of science and technology : (1) Emergence of the modern science
6. Historical investigation of science and technology : (2) technology in the Medieval West and the non -Western World
7. Historical investigation of science and technology : (3) Significance of the Industrial Revolution
8. Sociology of science and technology: (1) Normative structure and Paradigm
9. Sociology of science and technology: (2) Social constructivism and Laboratory life analysis
10. The 1950s model of science and technology policy in the Cold War
11. Innovation and Science and Technology
12. Knowledge industrial society since 1970s: (1) Environmental problem and energy prpblem
13. Knowledge industrial society since 1970s: (2) Computer science and Information society
14. Science and technology in the global economy since 1990s
15. Concluding remark: Science and technology in the future

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124979/

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124980/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124981/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)
⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Presentation Method (D)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124982/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (D)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal. (2)
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124983/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (D)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124984/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Autonomous Adaptive Systems Engineering

Professor · Norihiko Ono, *Associate Professor* · Yoshio Mogami (2 units)

Target〉 This class provides the knowledge and skills necessary for understanding the basic concepts, theories and application techniques concerning the emergent systems design methodologies for autonomous and adaptive intelligent agent systems.

Outline〉 Recently, autonomous adaptive systems have been studied that are able to improve their own performance autonomously, adaptively and incrementally during the course of interactions with the environments, and those design methodologies have been explored for the systems. This class covers the emergent design methodologies for autonomous adaptive agents and multi-agent systems, mainly based on machine learning and evolutionary computation.

Style〉 Lecture

Keyword〉 autonomous adaptive systems, emergent systems design, reinforcement learning, evolutionary computation, multi-agent sytems

Fundamental Lecture〉 "Autonomous Intelligent Systems"(0.5, ⇒237 page)

Goal〉 This class aims at the understanding of an overview of the emergent design methodologies for autonomous adaptive agents and multi- agent systems, mainly based on reinforcement learning, evolutionary computation, genetic programming, and neural networks, as well as the applicabilities and limitations of the methodologies.

Schedule〉

1. Emergent systems design methodologies
2. Foundations of emergent systems design: reinforcement learning (1)
3. Foundations of emergent systems design: reinforcement learning (2)
4. Foundations of emergent systems design: evolutionary computation (1)
5. Foundations of emergent systems design: evolutionary computation (2)
6. Foundations of emergent systems design: genetic programming
7. Foundations of emergent systems design: neural networks
8. Emergent systems design methodologies based on reinforcement learning (1)
9. Emergent systems design methodologies based on reinforcement learning (2)
10. Emergent systems design methodologies based on neuro-evolution (1)
11. Emergent systems design methodologies based on neuro-evolution (2)
12. Emergent systems design methodologies based on genetic programming
13. Emergent systems design methodologies based on co-evolution
14. Emergent systems design methodologies for multi-agent systems (1)
15. Emergent systems design methodologies for multi-agent systems (2)
16. Report

Evaluation Criteria〉 Attendance (30%), report (70%)

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125079/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Ono (D106, +81-88-656-7509, ono@is.tokushima-u.ac.jp)

⇒ Mogami (C404, +81-88-656-7505, moga@is.tokushima-u.ac.jp)Tue. 17:00–18:00, Wed. 15:30–17:30 (Refer to the notice of the department in every year.)

Visual pattern processing

Professor · Shunichiro Oe, *Associate Professor* · Kenji Terada (2 units)

Target〉 The basic technologies which replace the visual pattern processing function of man by computer and their applied technologies are made to master.

Outline〉 The advanced processing techniques of visual pattern, i.e., the pre-processing techniques, the feature extraction techniques, the classification techniques of visual pattern, the processing techniques of color image and their application examples are lectured.

Style〉 Lecture in combination with Portfolio

Keyword〉 pattern recognition, vision, image processing

Fundamental Lecture〉 "Applied Image Processing"(1.0, ⇒239 page)

Goal〉 Acquisition of knowledge about the processing theories of visual pattern and their various applied technologies, and the processing technologies of color image

Schedule〉

1. Concept of pattern recognition
2. Statistical pattern classification method1
3. Statistical pattern classification method 2
4. Pattern classification method by the structural analysis technique
5. Pre-processing method of visual pattern
6. Feature extraction method of visual pattern 1
7. Feature extraction method of visual pattern 2
8. Segmentation method of visual pattern 1
9. Segmentation method of visual pattern 2
10. Pattern classification method by neural network
11. Pattern classification method by GA
12. Security image processing
13. Tracking of moving object
14. Texture analysis
15. The feature extraction method of color image and its application
16. Periodic examination

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125080/

Student〉 Able to be taken by only specified class(es)

Multimedia Communication Theory and Technology

Assistant Professor · Masami Mohri, *Professor* · Seishi Kitayama, *Assistant Professor* · Hitoshi Tokushige (2 units)

Target〉 This class provides the knowledge necessary to understand fundamental technics for multimedia information and communication systems, such as coding method of multimedia data, information security, network security, user authentication, cryptology

Outline〉 This lecture is focused on multimedia communication theory and technology. Particulary, Internet Technology, Computer Networks, Satellite Communications, Information Security and Cryptology, Multimedhia Coding Theory and Its Applications are explained in this lecture.

Style〉 Lecture

Keyword〉 Internet Technology, Computer Networks, Satellite Communications, Information Security, Multimedhia Coding Theory

Fundamental Lecture〉 "Advanced Exercise on Intelligent Science"(1.0, ⇒465 page)

Requirement〉 特になし

Goal〉

1. fundamental technics for multimedia information and communication systems can be learned
2. Development method for multimedia information and communication systems can be learned

Schedule〉

1. Multimedia Communication Theory and Technology
2. Coding Theory for Multimedia data (1)
3. Coding Theory for Multimedia data (2)
4. Coding Theory for Multimedia data (3)
5. Digital data Transmission (1)
6. Digital data Transmission (2)
7. Cryptology (1)
8. Cryptology (2)
9. Cryptology (3)
10. Information Security
11. Network Security (1)
12. Network Security (2)
13. Contents Protection for Maltimedia Data
14. User Authentication
15. Digital Signature
16. Assignment

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 Printed synopsises of lecture are distributed.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125081/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Mohri (C301, +81-88-656-7487, mmohri@is.tokushima-u.ac.jp)Monday 15:00–18:00
⇒ Kitayama (, +81-88-656-7482, kitayama@ee.tokushima-u.ac.jp)
⇒ Tokushige (C303, +81-88-656-9447, tokusige@is.tokushima-u.ac.jp)

Integrated Information System Design

Professor · Norio Akamatsu, Minoru Fukumi, *Associate Professor* · Takashi Shimamoto (2 units)

Target〉 The aim of this lecture is to master the modern design technologies of very large scale integrated circuits.

Outline〉 Very large scale integrated circuit (V-LSI) design and production method. Using CAD technology, VLSI logic design, testing and fabrication are explained. Design of high-speed algorithm and parallel distributed processing system. Neural network and genetic algorithm for integrated circuit design.

Style〉 Lecture and excercise

Requirement〉 It is necessary to get the unit of the mos integrated circuits in master cource.

Notice〉 In order to get the unit of this lecture, the grduate cource students should have learned the-state-of-the-art of the modern hardware technology, especially C-MOS integrated circuits.

Goal〉 This lecture is desighned to provide engineers and scientists with an introduction to the fieled of VLSI neurocomputing.

Schedule〉

1. Embedded software architecture
2. Real-time schedure method
3. System description language
4. Application specific integrated circuits
5. Power consumption and speed of very large scale integrated circuits
6. Shared memory and communication mrthod
7. Cash memory and main memory
8. System modeling and documentation
9. Partitioning and performance
10. deta flow graph and finite state machine
11. Behavior description language and Spec C
12. Control deta-flow graph and function synthesis
13. Neural computing board diagram using EEPROM-style programmable synapses
14. Layout patern example
15. Gate-sizing wiring and timing driven
16. Boundary scan and delay estimation

Evaluation Criteria〉 Unit evaluation contains test and design of VLSI

Textbook〉 Hardware Annealing in Analog VLSI Neurocomputing, Kluer Academic Publishers

Reference〉 Electronics Circuits, written by Norio Akamatsu

Webpage〉 http://www.A3.is.tokushima-u.ac.jp

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125082/

Student〉 Able to be taken by student of other department and faculty

Contact〉 Akamatsu (D209, +81-88-656-7493, akamatsu@is.tokushima-u.ac.jp)on Wednesday afternoon

Note〉 Lecturer will show the schedule of this lecture and design technologies.

Parallel and Distributed Processing Systems

Professor · Takao Shimomura, *Associate Professor* · Kenji Ikeda, *Assistant Professor* · Masahiko Sano (2 units)

Target〉 This class introduces the knowledge and design skills necessary for developing parallel and distributed processing systems, and parallel and distributed algorithms.

Outline〉 Architecutres of parallel and distributed processing systems, fault tolerance of distributed control systems and the development techniques of distributed systems for Web applications.(Portfolio style).

Style〉 Lecture in combination with Portfolio

Keyword〉 WWW, fault tolerance, Parallel and Distributed Processing architecture

Fundamental Lecture〉 "Web Programming"(1.0, ⇒240 page)

Goal〉 1. To understand the architecture of parallel and distributed processing systems, decentralized adaptive control systems and their fault tolerance, and the design of distributed WWW systems.

Schedule〉

1. Parallel and distributed processing architectures
2. Memory and communicaton architectures
3. Parallel and distributed operating systems
4. .Client server model
5. Cluster computing
6. linear space and normed space
7. small gain theorem and its applications
8. decentralized systems composed of interconnected subsystems
9. stability of decentralized control systems
10. fault tolerance of decentralized control systems
11. Servlets and JavaServer Pages
12. Web application servers
13. Web application systems
14. Web programming frameworks
15. Web programming design patterns
16. Assignment

Evaluation Criteria〉 Assignment count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125083/

Student〉 Able to be taken by only specified class(es)

Contact〉 Shimomura (C402, +81-88-656-7503, simomura@is.tokushima-u.ac.jp)Wed 15:00~ 18:00

Applied Knowledge Systems

Professor · Jun-ichi Aoe, Kenji Kita, Fuji Ren, *Associate Professor* · Masami Shishibori, Shingo Kuroiwa, *Assistant Professor* · Masao Fuketa (2 units)

Target〉 The course introduces the basic principle and theory of knowledge-based systems, including natural language processing systems, voice language processing systems, information retrieval systems.

Outline〉 Knowledge systems to natural language processing, voice language processing, information retrieval and document database. Artificial natural language processing systems, such as automatic building systems of intelligent dictionaries, text understanding and summarization systems, dialog systems, natural language interface systems, text classification systems, natural language analysis systems and knowledge-based machine translation systems.

Style〉 Portfolio

Keyword〉 knowledge-based system, natural language processing system, speech and language processing system, information retrieval system, machine translation system

Fundamental Lecture〉 "Language Modeling"(1.0, ⇒235 page), "Natural Language Understanding"(1.0, ⇒241 page)

Relational Lecture〉 "Multimedia Systems and Applications"(0.5, ⇒464 page)

Goal〉 To learn various methods for constructing knowledge-based intelligent information systems.

Schedule〉

1. Natural language processing systems 1: design and retrieval methods of dictionaries
2. Natural language processing systems 2: design and implementation of parsers
3. Natural language processing systems 3: design and implementation of language understanding systems
4. Machine translation systems 1: rule-based and example-based approaches
5. Machine translation systems 2: super-function
6. Machine translation systems 3: integrated methods
7. Speech and language processing systems 1: design of language models
8. Speech and language processing systems 2: design of acoustic models
9. Speech and language processing systems 3: design of search algorithms
10. Information retrieval systems 1: document retrieval based on vector space models
11. Information retrieval systems 2: retrieval methods based on inverted index files
12. Information retrieval systems 3: design and implementation of intelligent document retrieval systems
13. Intelligent multimedia contents processing systems 1
14. Intelligent multimedia contents processing systems 2
15. Recent topics
16. Assignment

Evaluation Criteria〉 Assignment count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125084/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Aoe (Dr604, +81-88-656-7486, aoe@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20
⇒ Kita (Dr503, +81-88-656-7496, kita@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20
⇒ Ren (C204, +81-88-656-9684, ren@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20

Intelligent Information Systems

Professor · Yoneo Yano, *Associate Professor* · Kazuhide Kanenishi, Hiroaki Ogata, Teruaki Ito (2 units)

Target〉 Learning the design methods of intelligent information systems such as educational software and interactive systems.

Outline〉 Intelligent systems and their mechanics. Intelligent CAI. Intelligent interface. Micro-worlds in intelligent CAI. Learner-teacher modelling. Knowledge acquisition models. Empirical and analytical machine learning, e. g., ID3, similarity-, explanation-, and case-based learning. Genetics-based machine learning, e. g., genetic evolution and co-evolution of production systems, finite state machines, recurrent neural networks, and strategic knowledge. Concepts of collaborative interface systems based on intelligent interactions, and their implementation for design support systems.

Style〉 Lecture and excercise

Keyword〉 Intelligent Interface, Intelligent Educational Systems, Intelligent Agents, CSCW, CSCL, Interactive Interface

Fundamental Lecture〉 "Human Factors"(1.0, ⇒448 page)

Relational Lecture〉 "Applied Knowledge Systems"(0.5, ⇒462 page), "Autonomous Adaptive Systems Engineering"(0.5, ⇒457 page)

Goal〉 Acuisition of the design methods of educational systems and interactive systems

Schedule〉

1. Overview of Intelligent Information Systems
2. Intelligent CAI
3. Cognitive model for Learning
4. Design of ITS(Intelligent Tutoring System)
5. ILE(Interactive Learning Environment)
6. CSCL
7. Ubiquitous and Mobile Learning Environment
8. Design of Intelligent Interactive System
9. Collaborative Interface
10. Design of Intelligent Information System (1)
11. Design of Intelligent Information System (2)
12. Design of Intelligent Information System (3)
13. Design of Intelligent Information System (4)
14. Design of Intelligent Information System (5)
15. Conclusion

Evaluation Criteria〉 We will grade based on reports and interactive presentation among students.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125085/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Yano (C511, +81-88-656-7495, yano@is.tokushima-u.ac.jp)
⇒ Kanenishi (, +81-88-656-7285, marukin@cue.tokushima-u.ac.jp)
⇒ Ogata (C507, +81-88-656-7498, ogata@is.tokushima-u.ac.jp)
⇒ Ito (M316, +81-88-656-2150, ito@me.tokushima-u.ac.jp)

Multimedia Systems and Applications

Professor · Shunichiro Oe, Kenji Kita (2 units)

Target〉 Multimedia has become an indispensable part of modern computer technology. This course covers the theories, models, and systems of basic and advanced methods for designing and implementing multimedia systems. Latest multimedia Web technologies and some advanced topics will also be discussed.

Outline〉 The course introduces the theories, models, and systems of basic and advanced methods for next generation digital contents processing, including (1) intelligent processing for texts, speech, images, and movies, (2) intelligent media integration, and (3) intelligent human-computer interfaces.

Style〉 Portfolio

Keyword〉 multimedia, digital contents, human-computer interface, media integration

Fundamental Lecture〉 "Language Modeling"(1.0, ⇒235 page), "Applied Image Processing"(1.0, ⇒239 page)

Relational Lecture〉 "Applied Knowledge Systems"(0.5, ⇒462 page)

Goal〉 To learn advanced methods in design and implementation of next generation digital contents processing systems.

Schedule〉

1. Multimedia contents fundamentals
2. Image, video, and audio compression
3. Intelligent document processing (1)
4. Intelligent document processing (2)
5. Intelligent image and video processing (1)
6. Intelligent image and video processing (2)
7. Intelligent speech processing (1)
8. Intelligent speech processing (2)
9. Multimedia storage systems and databases (1)
10. Multimedia storage systems and databases (2)
11. Multimedia information retrieval (1)
12. Multimedia information retrieval (2)
13. Multimedia Web Technologies (1)
14. Multimedia Web Technologies (2)
15. Recent topics
16. Assignment

Evaluation Criteria〉 Assignment count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125086/

Contact〉

⇒ Oe (C204, +81-88-656-7500, oe@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20
⇒ Kita (Dr503, +81-88-656-7496, kita@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20

Advanced Exercise on Intelligent Science

All teachers (2 units)

Target〉 To conduct research leading to the awarding of doctoral degrees.

Outline〉 To conduct research in the Natural Language Understanding, Document Processing, Multimedia Information Retrieval, Image Processing, Movie Image Processing, Voice Recognition, Autonomous Agents Design, Internet Security, Intelligent Software, etc (seminars, portfolios etc).

Style〉 Lecture in combination with Portfolio

Keyword〉 Information Science, Software Engineering

Notice〉 Course plan differs depending on the laboratory you choose.

Goal〉 To present the results of your research related conferences, departmental research meetings, etc.

Schedule〉

1. After the student selects the subjects, research can be carried out at the laboratory. However, the course contents are as shown below.
2. コーパスからスーパー関数の自動抽出及び機械翻訳への応用
3. 話者認識における長 · 短期間の音声変動に関する研究
4. カットシーン間の距離分布に基づく CM 映像検出手法に関する研究
5. 進化的 RBF ネットワークによる三次元物体認識
6. リカレントニューラルネットワークの構造と重みの同時最適化のための進化計算手法に関する研究
7. メモリ展開されたコードを使う未知ウイルス解析支援システム
8. ウイルスの感染挙動と感染環境の状態を把握するための仮想ウイルス感染ネットワークに関する研究
9. PZT カメラを用いた教材コンテンツ作成のための講演者追跡システムの開発
10. 自由文からの感性情報解析技術に関する研究
11. 固有商品の好評不評情報抽出に関する研究
12. Web 上での学習活動を再現 · 共有可能にする WBL システム
13. ペン入力インタフェースにおけるジェスチャー評価実験
14. 自然言語処理技術を用いた中学理科教授学習システム
15. 脇見運転防止のための近赤外線カメラを用いた顔の向き検出
16. 単音節認識のための基本周期を用いた母音認識

Textbook〉 None

Reference〉 Using papers for each research field.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125087/

Student〉 Able to be taken by only specified class(es)

Contact〉 Committee Member of School Affair

Advanced Research on Intelligent Science

Teachers in other colleges or departments (2 units)

Target〉 To obtain broad information on recent engineering

Outline〉 To research a theme in a technology, which is different form the main technology in your field.

Style〉 Portfolio, Lecture in combination with Portfolio, Lecture and excercise

Keyword〉 Engineering, Technology, Different field

Requirement〉 N/A

Notice〉 N/A

Goal〉 To learn a recent technology, which is different from the main technology in your field.

Schedule〉

1. Choose a theme on technology or engineering, which is different from that in your field.

Evaluation Criteria〉 Evaluated with portfolio or examination.

Textbook〉 Ask to teachers.

Reference〉 Prints

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125088/

Student〉 Able to be taken by only specified class(es)

Systems Innovation Engineering — Information Science and Intelligent Systems
Web page and CMS related subject

- *Integrated Subjects*
  - Human Factors ..... WEB page, CMS
  - Life Science ..... WEB page, CMS
  - Social Science ..... WEB page, CMS
  - Science and Technology Studies ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Presentation Method (D) ..... WEB page, CMS
  - Internship (D) ..... WEB page, CMS
  - Venture Business (D) ..... WEB page, CMS
- *Specialized Subjects*
  - Autonomous Adaptive Systems Engineering ..... WEB page, CMS
  - Visual pattern processing ..... WEB page, CMS
  - Multimedia Communication Theory and Technology ..... WEB page, CMS
  - Integrated Information System Design ..... WEB page, CMS
  - Parallel and Distributed Processing Systems ..... WEB page, CMS
  - Applied Knowledge Systems ..... WEB page, CMS
  - Intelligent Information Systems ..... WEB page, CMS
  - Multimedia Systems and Applications ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Exercise on Intelligent Science ..... WEB page, CMS
  - Advanced Research on Intelligent Science ..... WEB page, CMS

Systems Innovation Engineering — Optical Systems Engineering
Syllabus of subjects

List of Subjects

Human Factors

Part-time Lecturer · Atsuya Yoshida (2 units)

Target〉 The objective of this class is to provide students with sufficiently thorough appreciation of the many facets of the human factors discipline so that they may make use of it to their own doctoral works.

Outline〉 This class offers a broad and comprehensive overview of the human factors/ergonomics discipline with four areas of emphasis, (1) historical review of human factors research, (2) human physical, perceptual and cognitive capabilities and limitations, (3) application of human factors research data in design, especially in the interface design of computer-based systems, and (4) discussion about the relationship between the designed system (technology) and people.

Schedule〉

1. What is Human Factors
2. Historical Overview of Human Factors
3. Multi-Disciplinary Aspect of Human Factors
4. Health and Safty Issue of Human Factors
5. Human Psychological Capability
6. Task Analysis
7. Human Error
8. Universal Design
9. Cognitive Artifact
10. Visibility and Affordance
11. Human-Computer Interaction
12. Human Information Processing
13. Knowledge and Mental Model
14. Usability Paradigms and Principles
15. Evaluation and Testing
16. Making system that makes us smart

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124976/

Life Science

Part-time Lecturer · Hiroshi Takagi, *Professor* · Akihiko Tsuji (2 units)

Target〉 Understanding of significance of protein in biotechnology

Outline〉 Basics of structure, function and application of protein are introduced

Style〉 Lecture

Keyword〉 Protein, Enzyme, Biotechnology

Goal〉

1. Understanding of multiple functions of proteins
2. Understanding of principle of protein engineering and its application

Schedule〉

1. Introduction of life science
2. History of life science
3. Structure and function of DNA and RNA
4. mRNA is a template of protein
5. Duplication of DNA
6. Regulation of protein expression
7. Human Genetics
8. Genetic disease
9. DNA diagnosis
10. Structure and function of protein
11. Principle of gene technology (1)
12. Principle of gene technology (2)
13. Protein engineering
14. Future of life science (1)
15. Future of life science (2)
16. Preparation of report

Evaluation Criteria〉 Evaluation by report

Textbook〉 To be introduced in the class

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124977/

Contact〉 Tsuji (G712, +81-88-656-7526, tsuji@bio.tokushima-u.ac.jp)Monday 16:20-17:50

Social Science

Part-time Lecturer · (2 units)

Target〉 The mutual relationship of economic activities, the structure and function of economic society, and the concept and technique of mathematical programming modelling are lectured.

Outline〉 Not only the mutual relationship of economic activities is explained from domestic and international points of view, but also the technique of case studies by application of mathematical programming models is tought using the various kinds of materials and examples.

Keyword〉 Economic activities, Structure and function, Mathematical programming model

Goal〉 To understand the mutual relationship of economic activities, empirically explain them using the mathematical programming model and evaluate the model.

Schedule〉

1. Guidance and purpose of this subject
2. Examples of economic activities 1
3. Examples of economic activities 2
4. Examples of economic activities 3
5. Change in structure of economic society 1
6. Change in structure of economic society 2
7. Function of economic society 1
8. Function of economic society 2
9. Mutual relationship of economic activities 1
10. Mutual relationship of economic activities 2
11. Concept of mathematical programming model
12. Technique of model construction
13. Modelling of economic activities 1
14. Modelling of economic activities 2
15. Evaluation of modelling

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124978/

Contact〉 Kondo (ECO602, +81-88-656-7339, kondo@eco.tokushima-u.ac.jp)

Science and Technology Studies

Part-time Lecturer · (2 units)

Target〉 Let to learn the minimum essentials of science and technology studies and its function in contemporary society.

Outline〉 The science and technology studies deal with science and technology research and its outcomes by means of various methods of social science and humanities. The discipline emerged in 1930s when social importance of science and technology became evident. Since 1970s, the science and technology studies have developed as mission oriented learning for government policy, buisiness administrations and civic activity. students are expected to learn the outline of this discipline : the philosophy of science, history of science and technology, and sociology of science and technology, as well as their application to the problems in contemporary society since 1970s.

Style〉 Lecture

Goal〉

1. Understanding of the minimum essentials of the science and technology
2. Understanding of the social meaning of each student's research

Schedule〉

1. Introduction: A brief history of the science and technology studies since 1930s
2. Philosophical understanding of science: (1) Greek classics and scholastic study
3. Philosophical understanding of science: (2) Science study in Enlightenment and German Classics
4. Philosophical understanding of science: (3) Rise of the philosophy of science in the early twentieth century
5. Historical investigation of science and technology : (1) Emergence of the modern science
6. Historical investigation of science and technology : (2) technology in the Medieval West and the non -Western World
7. Historical investigation of science and technology : (3) Significance of the Industrial Revolution
8. Sociology of science and technology: (1) Normative structure and Paradigm
9. Sociology of science and technology: (2) Social constructivism and Laboratory life analysis
10. The 1950s model of science and technology policy in the Cold War
11. Innovation and Science and Technology
12. Knowledge industrial society since 1970s: (1) Environmental problem and energy prpblem
13. Knowledge industrial society since 1970s: (2) Computer science and Information society
14. Science and technology in the global economy since 1990s
15. Concluding remark: Science and technology in the future

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124979/

Contact〉 Isaka (E-2F-B-9, +81-88-656-7459, isaka@ee.tokushima-u.ac.jp)

Management Theory of New Business

Associate Professor · Tatsuya Deguchi, *Part-time Lecturer* · First-line men with experience of practical business (2 units)

Target〉 New business is the word which means the business to make the most of technical knowledge, technology, the new idea and which is developed creatively, and that main bearer is the enterprise called a venture. There is a purpose of this class in providing the knowledge which is necessary, and know-how and a spirit so that a taking lecture student may establish a venture business.

Outline〉 The regeneration of the Japanese society with the vitality is being asked. Government enforced "a university venture 3 years 1000 companies plan" over Heisei 14-the 16th year. Though that goal was almost attained, it is very important to promote entrepreneur education continuously from now on. Tokushima Prefecture supports this class based on the recognition done like this, and it is established.

Requirement〉 The person whom the one with the classroom is constructed by the class start time in the person who doesn't learn the unit of "Introduction to new business" in the college, and a group are organized, and it is limited to the person with the intention to make a business plan, and taking lecture is recognized.

Notice〉 Being late and a whisper in class should be prohibited strictly. Be careful over and again because it should dispose of exit and future taking lecture may not be recognized when it is wicked.

Goal〉 Learning of the necessary knowledge to establish venture business,and the ability which can make a business plan.

Schedule〉

1. Guidance
2. What is the new business?
3. Keynote lecture
4. Theory of a stand-alone version venture success
5. The law knowledge which is necessary for entrepreneur
6. Fund-raising and capital policy
7. Indirect finance
8. Direct finance
9. The basis of the company management
10. The elementary knowledge of the business accounting
11. The point of the business plan preparation
12. Management strategy and marketing
13. Product development and intellectual property
14. Business plan preparation practice
15. Examination
16. Business plan announcement meeting

Evaluation Criteria〉 It is evaluated by the presentation (40%) of the written examination (60%) and the business plan. And, the presentation of the written examination and the business plan is decided to be recognized only for the taking lecture student who attended it for 2/3 and more of the classes that it is opened.

Textbook〉 The summary is distributed every time.

Reference〉 Several are introduced in the school hours.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124980/

Student〉 he person who hasn't learned the unit of the new business outline that it is opened with this learning in all the students enrolled in the graduate school yet is made the target. The number of completion people may be restricted in the method such as a lottery in case of a taking lecture applicant many. As for the details, an applicant for taking lecture is to follow those directions because the notice which showed attention in taking lecture is done.

Note〉 The man of business that it is active in the forefront every time, and an adviser are invited as an instructor, and working knowledge is provided for theory plus practice in this class from the specialist's position. This class is the thing which is useful enough even if it is taken to the person who aims at a general enterprise and a laboratory, the employment to the self-governing body and so on.

Introduction to Intellectual Property

Part-time Lecturer · , · Juichiroh Osame, Akio Fujii, Yasushi Toyosu, Kuniaki Kubota (2 units)

Target〉 Understanding the basic systems and importance of protection and practical use of intellectural property based on some examples.

Outline〉 It is necessary for a working staff in a company, a university, etc., in a future.It is introduced the importance to protect and practical use of intellectural property at governments , industrial circles, univesities and institutes in Japan using potential on scientific techniques. This lecture is treated the basic systems of protection and practical use of intellectural property particularly based on strategy and invasion of patent in an organization such as company, university, etc.

Style〉 Lecture

Keyword〉 Intellectural property, Patent Law, Protect and Use of Intellectural Property

Relational Lecture〉 "Introduction to Intellectual Property"(0.5)

Requirement〉 No requierement

Notice〉 It is necessary to be present at two concentrated lecture.

Goal〉

1. Understanding concept of intellectural property right.
2. Undestand the Patent Act, the Trademark Act,the Design Act and the Copyright Act.
3. Understanding on basical practical use of intellectural property.

Schedule〉

1. Concept of intellectural property(Sakai)
2. Outline of intellectural property(Patent and Trademark)(Sakai)
3. Outline of intellectural property(Design and Copyright)(Sakai)
4. Patent, invention and invasion of patent (Sakai)
5. Management of intellectural property and use (Sakai)
6. A way of research and development and intellectural property in a future(Sakai)
7. The midterm examination and its comment for Target and
8. History of system of intellectural property (Osame)
9. International trend of system of intellectural property (Osame)
10. Acquisition method of intellectural property right(Fujii)
11. Use of intellectural property(Watanabe)
12. Stetragy of intellectural property on development of techniques(Y.Higuchi)
13. Effective intellectural property in development of techniques (Kubota)
14. Special lecture on a use of intellectural property by a chief executive officer(1)
15. Special lecture on a use of intellectural property by a chief executive officer(2)

Evaluation Criteria〉 Passing mark is over 60% on the examinations and the reports for each reaching level, respectively.

Textbook〉 To be used textbooks made by lecturers.

Reference〉 Nobuhiro Nakayama:Titeki Shoyuken, Nikkan Kohgyo Shinbunnsha

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124981/

Student〉 For the course students and other graduate school students.

Contact〉

⇒ (+81-3-5600-2631,)

⇒ Mizuguchi (A501, +81-88-656-7349, mizuguch@ce.tokushima-u.ac.jp)Monday,11:00-12:30, 17:00-18:00

Presentation Method (D)

(2 units)

Target〉 Poster and oral presentations, and journal publications are common means of appealing the research work in various scientific and technological disciplines. It's undoubtedly important for activating the research work. The lecture is intending for students to learn most efficient way to appeal their findings and discussions in scientific community.

Outline〉 Credits are acknowledged to the students who are supervised to give conference speech by themselves and do actually the lectures.

Goal〉 The lecture is aiming at having knowledge and experience of the presentaion in international conferences.

Evaluation Criteria〉 Students' achievement is evaluated by portfolios submitted showing the progress in preparation of international conferences as well as by presentation records.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124982/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Internship (D)

(2 units)

Target〉 This program is provided to increase knowledge and experience in the actual industrial technology in various fields. Through the practical experience, the program will allow students to become discerning and well-balanced researchers or engineers with deeper understanding of technological societies.

Outline〉 Credits are acknowledged to students who experienced the internship in companies and/or goverment offices. Their fulfilment is evaluated by activity reports during internship.

Goal〉

1. Grasping internal systems of a company, management, action and strategy to achieve the company's goal. (2)
2. Understanding human relationship and communicative manner in a working society and a company.

Evaluation Criteria〉 Achievement is evaluated by how you tackled, activity reports, and an evaluation record submitted by supervisers in company and/or government.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124983/

Student〉 Able to be taken by only specified class(es)

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Venture Business (D)

(2 units)

Target〉 Aims of the lecture are doing collaborative works with private enterprises and establishing venture businesses through such works.

Outline〉 The lecture is aiming at founding a venture business company as well as establishing collaborative research works with private enterprises. It's worth to apply their accomplishment to an actual society beyond the range of a laboratory work.

Goal〉 Objective of the lecture is to have experience and knowledge of collaborative works with private enterprises and to mature the works to venture businesses.

Evaluation Criteria〉 Credits are ackowledged in case of doing collaborative works with enterprises and/or maturing them to venture businesses. Handouts, reports, and presentation materials, etc. are evaluated to approve credits.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/124984/

Note〉 A possible student should submit portfolios which are evidenced for his/her 90 hours' extensive work. Students are advised to ask details about this lecture to their supervisers.

Radio Frequency Solid State Physics

Professor · Takashi Ohno, *Assistant Professor* · Koichi Nakamura (2 units)

Target〉 This class introduces basis of NMR and applications to studies on superconductivity, magnetism and ionic diffusion in solid.

Outline〉 The spectrum, spin-lattice relaxation, spin-spin relaxation, chemical shift etc., which are obtained by NMR measurements, are introduced and discussed in connection with various physical properties of solids.

Keyword〉 Nuclear Magnetic Resonance, Nuclear magnetic moment, Magnetism, Diffusion, Superconductor, Spin - lattice relaxation, Knight shift

Goal〉

1. To understand basis of NMR.
2. To understand relationship between various problems in solid state physics and relaxation phenomena observed using NMR.

Schedule〉

1. Introduction
2. Spin-echo and NMR spectrum
3. Equipments
4. Dipole interaction
5. Hyperfine interaction and spectrum
6. Chemical shift
7. Quadrupole interaction and quadrupole resonance
8. Spin-lattice relaxation
9. Internal magnetic field in ferro and antiferro magnets
10. Spin-lattice relaxation in metals
11. NMR studies on superconducting state
12. NMR studies on High Tc superconductors
13. Diffusion in solid and spin-lattice relaxation
14. NMR studies on lithium ionic conductors
15. NMR studies on protonic conductors
16. Summary

Evaluation Criteria〉 Report 100%

Textbook〉 遍歴電子系の核磁気共鳴 (朝山邦輔著, 裳華房)

Reference〉 To be introduced in the class

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125090/

Contact〉

⇒ takashi Ohno (A201, 656-7549)
⇒ Nakamura (A216, +81-88-656-7577, koichi@pm.tokushima-u.ac.jp)

Engineering of Correlated Electron Matter

Professor · Yutaka Kishimoto, *Assistant Professor* · Yu Kawasaki (2 units)

Target〉 In many solid-state materials, new phenomena evolve due to strong electron interactions. In this Lecture, review will be given on some advanced topics and their applications, including high temperature superconductivity, metal-insulator transition and strongly correlated electronics.

Outline〉 New types of superconducting and magnetic phenomena emerge in correlated electron matters. The term "correlated electron" represents the state of matter where many electrons are strongly interacting with each other. After an introductory talk on magnetism and superconductivity, review will be given on some advanced topics, including high temperature superconductivity, metal-insulator transition and colossalmagneto resistance. Potential application of correlated electron matters to technology is also presented focusing on spintronics or strongly correlated electronics.

Style〉 Lecture

Keyword〉 strongly correlated electron systems, Mott insulator, colossalmagneto resistance, high temperature superconductor

Goal〉 To understand basic concepts of correlated electron matter and its application

Schedule〉

1. Introduction to correlated electron matters
2. Perspectives of magnetism and superconductivity in correlated electron matters
3. Electronic states of atoms and ions
4. Magnetic ions in crystal electric field
5. Introduction to superconductivity
6. How to probe rich properties in correlated electron matters
7. Mott insulator and metal-insulator transition
8. Spin, charge and orbital in transition metal oxides
9. Colossalmagneto resistance in transition metal oxides
10. Application of transition metal oxides with correlated electrons
11. High temperature superconductivity
12. Heavy-fermion superconductivity
13. Electronic states of organic conductors
14. Application of superconductors with correlated electrons
15. Towards strongly correlated electronics

Evaluation Criteria〉 Reports on several subjects in lecture

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125091/

Contact〉

⇒ Kishimoto (A202, +81-88-656-7548, yutaka@pm.tokushima-u.ac.jp)
⇒ Kawasaki (A217, +81-88-656-9878, yu@pm.tokushima-u.ac.jp)

Nonlinear Optical Devices

Professor · Masuo Fukui, *Associate Professor* · Masanobu Haraguchi (2 units)

Target〉 To understand the principle, tipical structure, advantages and disadvantages of current nonlinear optical devices. To develop ability to design new devices and solve verious problems for applications.

Outline〉 Physics of second-order and third-order nonlinear optical phenomena. Principles of electro-optics. Optical nonlinearities in fibers. Photorefractive materials. Nonlinear optical media. Anisotropic nonlinear optical media. Dispersive nonlinear optic media. Coupled-wave theory. Electro-optic and acousto-optic devices. Second-order and third-order nonlinear optic devices. Photonic switches. All-optical switches. Bistable optical devices. Optical connections.

Style〉 Portfolio

Keyword〉 nonlinear optics, harmonic generation, nonlinear optical device, optical switch

Relational Lecture〉 "Optical and Functional Inorganic Materials"(0.5, ⇒486 page), "Crystal Growth of Optical Materials"(0.5, ⇒481 page)

Requirement〉 Student should have fundamental knowledge of electromagnetic theory, waveoptics, optical properties of materials and lasers.

Notice〉 The following plan of this course is a example. Plans may be modified depending on knowledges and experiences of studens.

Goal〉

1. Possible to explain princiles, structure and characteristics of optoelectric devices.
2. Possible to explain princiles, structure and characteristics of the second-order nonlinear optical devices.
3. Possible to explain princiles, structure and characteristics of the third-order nonlinear optical devices.

Schedule〉

1. Introduction & interview
2. nonlinear optical phenomena
3. Electrooptic effect and its applications
4. Magnetooptic effect and its applications
5. Acoustoptic effect and its applications
6. principle of second-order nonlinear effects
7. Second-order nonlinear optical materials
8. Second-order nonlinear optical devices
9. principle of third-order nonlinear effects
10. third-order nonlinear optical materials
11. Third-order nonlinear devices
12. Experiment for nonlienar optical phenomena
13. Current application of nonlinear devices
14. Photonic crystal
15. Integrated optical devices

Evaluation Criteria〉 Activity:20%, reports:40% and oral examinations:40%

Textbook〉 After interview, we will decide suitable text books.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125092/

Contact〉

⇒ Haraguchi (Opt.209, +81-88-656-9411, haraguti@opt.tokushima-u.ac.jp)
⇒ Fukui (Opt.208, +81-88-656-9410, fukui@opt.tokushima-u.ac.jp)

Crystal Growth of Optical Materials

Professor · Tetsuo Inoue, *Assistant Professor* · Atsushi Mori (2 units)

Target〉 The purposes of the lecture are as follows: (1) Nucleation and growth mechanism of crystals, (2) Growing techniques of high quality optical crystals, (3)Computer simuration about the crystal growth.

Outline〉 Growth method of optical crystals from the melt, solution and vapor. Epitaxial growth. The relationship between the growth conditions and crystal perfection. The relationship between the optical properties and crystal perfection. Characterization of crystals. Atomistic theory of crystal growth. Computer simulation of crystal growth. Method of statistical mechanics and thermodynamics. Theory of surface and interface. Development of advanced materials.

Keyword〉 optical crystals, computer simulation, solid liquid interface, defect of crystals, growth method of crystals

Relational Lecture〉 "Photonic Semiconductor Device Physics"(0.5, ⇒485 page), "Optical and Functional Inorganic Materials"(0.5, ⇒486 page), "Organic Photo-functional Materials"(0.5, ⇒482 page)

Goal〉

1. Growing method of optical materials
2. Defect generation during growth
3. Computer simulation for crystal growth

Schedule〉

1. Growing methods of optical materials (1)
2. Growing methods of optical materials (2)
3. Growing methods of optical materials (3)
4. Defects of crystals (1)
5. Defects of crystals (2)
6. Defect generation during growth
7. Characterization of crystals (1)
8. Characterization of crystals (2)
9. Nucleation (1)
10. Nucleation (2)
11. Physics of solid liquid interface (1)
12. Physics of solid liquid interface (2)
13. Preparation of colloidal crystals
14. Computer simulation for crystal growth (1)
15. Computer simulation for crystal growth (1)

Evaluation Criteria〉 Report

Textbook〉 Teaching materials

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125093/

Student〉 Able to be taken by only specified class(es)

Contact〉 Inoue (Opt.310, +81-88-656-9416, inoue@opt.tokushima-u.ac.jp)

Organic Photo-functional Materials

Professor · Hitoshi Tanaka, *Assistant Professor* · Yoshihiko Tezuka (2 units)

Target〉 The objective of this course is to develop basic and practical knowledge of chemistry that is required to design, synthesize, and construct organic materials with desired functionality.

Outline〉 Physical and chemical properties of molecules and molecular assemblies. Molecular design for functional materials based on the molecular structure. Synthetic method for constructing desired molecular structures. Molecular design, and characteristics of organic photo-functional materials (Tanaka). Physical and chemical properties of conjugated π-electron system and its application for opto-electronic devices (Tezuka).

Style〉 Portfolio

Relational Lecture〉 "Optical and Functional Inorganic Materials"(0.5, ⇒486 page)

Goal〉

1. to enable a student to understand functionality of organic materials in terms of their molecular structures.
2. to enable a student to construct practical routes for synthesizing desired molecules.

Schedule〉

1. Introduction to organic materials
2. Atomic groups expressing photo-functionality (1)
3. Atomic groups expressing photo-functionality (2)
4. Generation of photo-functionality by molecular assembly
5. Chemical modification (1): incorporation of functional atomic groups
6. Chemical modification (2): incorporation of functional atomic groups
7. Chemical modification (3): polymerization and polymer reaction
8. Spectroscopic analysis of molecular structure
9. Introduction to π-electron conjugated molecules
10. Synthesis of π-electron conjugated molecules
11. Properties of π-electron conjugated molecules (1)
12. Properties of π-electron conjugated molecules (2)
13. Applications to organic conducting materials
14. Applications to organic electroluminescence devices
15. Applications to organic solar cells

Evaluation Criteria〉 Term papers and oral examination.

Textbook〉 Text books will be decided after interview.

Reference〉 – to be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125094/

Contact〉

⇒ Tanaka (Opt.211, +81-88-656-9420, tanaka@opt.tokushima-u.ac.jp)
⇒ Tezuka (Opt.307, +81-88-656-9423, ytezuka@opt.tokushima-u.ac.jp)

Advanced Optical Information Systems

Undecided, *Associate Professor* · Yoshio Hayasaki (2 units)

Target〉 To understand an architecture, design, and device in optical information systems.

Outline〉 Information processing systems using optoelectronics devices and technologies which include lasers, light emitting diodes, spatial light modulators, nonlinear recording devices and holographic technology: holographic systems, optical computing systems, three-dimensional display systems, optical recording systems, and optical measurmeut systems. This course is performed with lecture in combination with portfolio.

Keyword〉 Information photonics, Optical computer, Optical information processing, Information optics

Goal〉

1. To understand the availability of light in optical information system
2. To understand the relation between information photonics and other technology
3. To develop a new architectur of optical information system

Schedule〉

1. Intoroduction to optical information system
2. Optics in optical information system (1)
3. Optics in optical information system (2)
4. Light source and detector in optical information system
5. Optical modulator in optical information system (1)
6. Optical modulator in optical information system (2)
7. Analog optical information system (1)
8. Analog optical information system (2)
9. Digital optical information system (1)
10. Digital optical information system (2)
11. Optelectronic information system (1)
12. Optelectronic information system (2)
13. Information comunication technology and optical information technology
14. Biomedical optical measurement technology and optical information technology
15. Biotechnology and optical information technology
16. Examination

Evaluation Criteria〉 Report 100%

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125095/

Medical Information Systems

Professor · Noboru Niki, *Associate Professor* · Yoshiki Kawata (2 units)

Target〉 To understand the fundamental concepts of digital environment for medical diagnosis. To learn the design methods of medical information systems.

Outline〉 This course introduces the design and the implementation of digital environment for medical diagnosis based on the various technologies including medical image data acquisition and retrieval, computer aided diagnosis using multimodal medical data sets.

Style〉 Portfolio

Keyword〉 Imaging technology, Computed-aided diagnosis systems, Digital environment for medical diagnosis

Relational Lecture〉 "Medical and Biological Engineering"(0.5, ⇒487 page)

Goal〉

1. To understand medical imaging techniques.
2. To understand various techniques of computer-aided diagnosis.
3. To understand the fundamentals of digital environment for medical diagnosis.

Schedule〉

1. Introduction
2. Imaging techniques
3. Image processing techniques
4. Pattern recognition techniques
5. Visualization techniques
6. Virtual reality/Mixed reality techniques
7. Design of computer-aided diagnosis systems
8. Implementation of computer-aided diagnosis systems
9. Design and implementation of fundamentals of digital environment for medical diagnosis and therapy
10. Design of medical information systems (1)
11. Design of medical information systems (2)
12. Design of medical information systems (3)
13. Design of medical information systems (4)
14. Design of medical information systems (5)
15. Advanced medical information systems

Evaluation Criteria〉 Report 100%

Textbook〉 Reference books are introduced to each topics.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125096/

Contact〉

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⇒ Kawata (Opt.508, +81-88-656-9431, kawata@opt.tokushima-u.ac.jp)

Photonic Semiconductor Device Physics

Professor · Shiro Sakai, *Associate Professor* · Yoshiki Naoi, Katsushi Nishino (2 units)

Target〉 To understand the device physics and fabrication technique of photonic semiconductor devices..

Outline〉 Interaction of photons and electrons in semiconductors, physics of superlattice semiconductors and their applications as photonic devices. Crystal growth of semiconductors and heteroepitaxy.

Style〉 Lecture

Keyword〉 Semiconductor, Photonic device

Relational Lecture〉 "Optical and Functional Inorganic Materials"(0.5, ⇒427 page)

Goal〉

1. To understand device physics of photonic devices in terms of interaction of photons and electrons
2. To understand device physics of quantum effect devices
3. To understand crystal growth and related technologies for fabrication of photonic devices

Schedule〉

1. Introduction
2. Energy band structure of semiconductors
3. Quantum statistics of electrons in semiconductors
4. Carrier transport in semiconductors
5. Quantum devices and superlattice
6. Light absorption in semiconductors (interaction of electrons and photons)
7. Photocinductivity, photovol and photodiode
8. Physics of light emission of semiconductors
9. Radiative recombination, non-radiative recombination, stimulated emission and spontaneous emission
10. Light emitting diodes and lasers
11. Devices for optical communication
12. Crystal growth of substrates for photonic semiconductor devices
13. MOCVD and MBE
14. Fabrication of Ohmic contact
15. Nano-photonic devices and fabrication technology
16. Examination

Evaluation Criteria〉 Report 50%, Examination 50%. More than 60% is required to pass this class.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125097/

Contact〉

⇒ Sakai (, +81-88-656-7446, sakai@ee.tokushima-u.ac.jp)
⇒ Naoi (, +81-88-656-7447, naoi@ee.tokushima-u.ac.jp)
⇒ Nishino (, +81-88-656-7464, nishino@ee.tokushima-u.ac.jp)

Note〉 This lecture will be given in English.

Optical and Functional Inorganic Materials

Professor · Yasuo Ohno, *Associate Professor* · Kikuo Tominaga (2 units)

Target〉 This cource aims to learn the fundamentals of material science of such as single crystals, polycrystals or amorphous films for optical and functional materials. At the same time, the synthesis methods of various films, their evaluation techniques and the propagating optical beam and acoustic waves in crystals are lectured.

Outline〉 Fundamentals of crystal science is lectured at first. Optical and electronic processes in optical and functional materials such as single crystals, polycrystals or amorphous films are followed. Advanced solid state physics of semiconductors, dielectric and ferroelectric materials are included. Synthesis methods of optical and functional crystals and films, evaluation methods of film properties are also contained. Electro-optical and piezo-electrical effects and solid state physics relating with their effects, characterization of crystals, symmetry elements of crystals and material constants,optical properties of crystals, electro-optical effects and nonlinear effects, piezoelectricity, acoustic waves in crystal,interaction of phtons and phonons in crystal, synthesis methods of thin films (PVD method; electron beam evaporation, MBE, sputtering, laser ablation), film properties (charaterizations of electrical, optical and mechanical properties) are included.

Style〉 Lecture and excercise

Keyword〉 Functional material, semiconductor device, crystal optics, thin film technology, deposition techniques of thin films

Relational Lecture〉 "Photonic Semiconductor Device Physics"(0.5, ⇒426 page), "Nonlinear Optical Devices"(0.5, ⇒428 page)

Goal〉 Understanding of the solid state physics of piezoelectric materials and functional thin films

Schedule〉

1. Characterization of crystals
2. Symmetry elements of crystals and material constants 1
3. Symmetry elements of crystals and material constants 2
4. Optical properties of crystals 1
5. Optical properties of crystals 2
6. Electro-optical effects and nonlinear effects 1
7. Electro-optical effects and nonlinear effects 2
8. Piezoelectricity 1
9. Piezoelectricity 2
10. Acoustic waves in crystal 1
11. Acoustic waves in crystal 2
12. Interaction of phtons and phonons in crystal
13. Synthesis methods of thin films 1(PVD method; electron beam evaporation, MBE, sputtering, laser ablation)
14. Synthesis methods of thin films 2(PVD method; electron beam evaporation, MBE, sputtering, laser ablation)
15. Film properties (Charaterizations of electrical, optical and mechanical properties)
16. Exercise

Evaluation Criteria〉 Reports for each theme and examination

Textbook〉 Tomoya Ogawa:Fundamentals in Crystal Engineering, Shoukabou (in Japanese) and Shunichi Gonda, Applied Handbook of Thin Film Depositions, (NTS)(in Japanese)

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125098/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Ohno (, +81-88-656-7438, ohno@ee.tokushima-u.ac.jp)
⇒ Tominaga (, +81-88-656-7439, tominaga@ee.tokushima-u.ac.jp)

Note〉 This lecture will be given in English.

Medical and Biological Engineering

Professor · Yohsuke Kinouchi, *Assistant Professor* · Masatake Akutagawa (2 units)

Target〉 Various applications of electronic technologies to medical fields are decsribed.

Outline〉 Fundamental approaches to apply engineering such as electronics to medical fields including diagnosis, treatment and alternative function are described in relation to life sciences such as physiology, biomechanics and so forth. Typical systems of medical instruments are introduced. The development of new technologies based on the intelligent functions of living bodies are presented. Functional characteristics of the nervous system and their application to information processing and control are discussed.

Style〉 Lecture in combination with Portfolio

Goal〉 1 Biological signal measurement 2 Biological signal processing 3 Medical systems

Schedule〉

1. Introduction of medical engineering
2. Introduction of measurement of biological signal
3. Electrical measurement methods
4. Magnetic measurement methods
5. Ultrasonic measurement methods
6. Other measurement methods
7. Biological signal processing methods
8. Examples of biological signal processing
9. Biological system identification
10. Measurement of brain functions
11. Measurement of other functions
12. Biological monitor
13. Analysis of electrical properties of tissue
14. Examples of medical diagnosis technology
15. Examples of medical treatment technology
16. Medical prosthesis technology

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125099/

Contact〉

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⇒ Akutagawa (, +81-88-656-7477, makutaga@ee.tokushima-u.ac.jp)Wed. 17:00 - 18:00, Fri. 17:00 - 18:00

Note〉 This lecture will be given in English.

Visual pattern processing

Professor · Shunichiro Oe, *Associate Professor* · Kenji Terada (2 units)

Target〉 The basic technologies which replace the visual pattern processing function of man by computer and their applied technologies are made to master.

Outline〉 The advanced processing techniques of visual pattern, i.e., the pre-processing techniques, the feature extraction techniques, the classification techniques of visual pattern, the processing techniques of color image and their application examples are lectured.

Style〉 Lecture in combination with Portfolio

Keyword〉 pattern recognition, vision, image processing

Fundamental Lecture〉 "Applied Image Processing"(1.0, ⇒239 page)

Goal〉 Acquisition of knowledge about the processing theories of visual pattern and their various applied technologies, and the processing technologies of color image

Schedule〉

1. Concept of pattern recognition
2. Statistical pattern classification method1
3. Statistical pattern classification method 2
4. Pattern classification method by the structural analysis technique
5. Pre-processing method of visual pattern
6. Feature extraction method of visual pattern 1
7. Feature extraction method of visual pattern 2
8. Segmentation method of visual pattern 1
9. Segmentation method of visual pattern 2
10. Pattern classification method by neural network
11. Pattern classification method by GA
12. Security image processing
13. Tracking of moving object
14. Texture analysis
15. The feature extraction method of color image and its application
16. Periodic examination

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125100/

Student〉 Able to be taken by only specified class(es)

Applied Knowledge Systems

Professor · Jun-ichi Aoe, Kenji Kita, Fuji Ren, *Associate Professor* · Masami Shishibori, Shingo Kuroiwa, *Assistant Professor* · Masao Fuketa (2 units)

Target〉 The course introduces the basic principle and theory of knowledge-based systems, including natural language processing systems, voice language processing systems, information retrieval systems.

Outline〉 Knowledge systems to natural language processing, voice language processing, information retrieval and document database. Artificial natural language processing systems, such as automatic building systems of intelligent dictionaries, text understanding and summarization systems, dialog systems, natural language interface systems, text classification systems, natural language analysis systems and knowledge-based machine translation systems.

Style〉 Portfolio

Keyword〉 knowledge-based system, natural language processing system, speech and language processing system, information retrieval system, machine translation system

Fundamental Lecture〉 "Language Modeling"(1.0, ⇒235 page), "Natural Language Understanding"(1.0, ⇒241 page)

Relational Lecture〉 "Multimedia Systems and Applications"(0.5, ⇒464 page)

Goal〉 To learn various methods for constructing knowledge-based intelligent information systems.

Schedule〉

1. Natural language processing systems 1: design and retrieval methods of dictionaries
2. Natural language processing systems 2: design and implementation of parsers
3. Natural language processing systems 3: design and implementation of language understanding systems
4. Machine translation systems 1: rule-based and example-based approaches
5. Machine translation systems 2: super-function
6. Machine translation systems 3: integrated methods
7. Speech and language processing systems 1: design of language models
8. Speech and language processing systems 2: design of acoustic models
9. Speech and language processing systems 3: design of search algorithms
10. Information retrieval systems 1: document retrieval based on vector space models
11. Information retrieval systems 2: retrieval methods based on inverted index files
12. Information retrieval systems 3: design and implementation of intelligent document retrieval systems
13. Intelligent multimedia contents processing systems 1
14. Intelligent multimedia contents processing systems 2
15. Recent topics
16. Assignment

Evaluation Criteria〉 Assignment count 100%.

Textbook〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125101/

Student〉 Able to be taken by only specified class(es)

Contact〉

⇒ Aoe (Dr604, +81-88-656-7486, aoe@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20
⇒ Kita (Dr503, +81-88-656-7496, kita@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20
⇒ Ren (C204, +81-88-656-9684, ren@is.tokushima-u.ac.jp)Tuesday 12:50 - 14:20

Advanced Exercise on Optical System Engineering

All teachers (2 units)

Target〉 This subject is especially provided in order to deepen the syudy, and must be taken under the guidance of a faculty in major field of study.

Outline〉 Exercises related to research theme are performed.

Style〉 Portfolio

Keyword〉 Optical engineering

Goal〉 To obtain deeper knowledge regarding research theme.

Schedule〉

1. Guidance
2. Exercise
3. Report

Evaluation Criteria〉 Assignments count 100%.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/134535/

Student〉 Able to be taken by only specified class(es)

Contact〉 Inoue (Opt.310, +81-88-656-9416, inoue@opt.tokushima-u.ac.jp)

Advanced Research on Optical System Engineering

All teachers (2 units)

Target〉 This subject is essentially provided in order to deepen the research, and must be taken under the guidance of a faculty in other field of study.

Outline〉 Exerecises related to research theme are perfomed.

Keyword〉 Research, Optical Engineering

Goal〉 To have wider knowledge regarding research theme.

Schedule〉

1. Guidance
2. Research
3. Report

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents Area〉 http://cms.db.tokushima-u.ac.jp/DAV/lecture/125103/

Student〉 Able to be taken by only specified class(es)

Contact〉 Inoue (Opt.310, +81-88-656-9416, inoue@opt.tokushima-u.ac.jp)

Systems Innovation Engineering — Optical Systems Engineering
Web page and CMS related subject

- *Integrated Subjects*
  - Human Factors ..... WEB page, CMS
  - Life Science ..... WEB page, CMS
  - Social Science ..... WEB page, CMS
  - Science and Technology Studies ..... WEB page, CMS
  - Management Theory of New Business ..... WEB page, CMS
  - Introduction to Intellectual Property ..... WEB page, CMS
  - Presentation Method (D) ..... WEB page, CMS
  - Internship (D) ..... WEB page, CMS
  - Venture Business (D) ..... WEB page, CMS
- *Specialized Subjects*
  - Radio Frequency Solid State Physics ..... WEB page, CMS
  - Engineering of Correlated Electron Matter ..... WEB page, CMS
  - Nonlinear Optical Devices ..... WEB page, CMS
  - Crystal Growth of Optical Materials ..... WEB page, CMS
  - Organic Photo-functional Materials ..... WEB page, CMS
  - Advanced Optical Information Systems ..... WEB page, CMS
  - Medical Information Systems ..... WEB page, CMS
  - Photonic Semiconductor Device Physics ..... WEB page, CMS
  - Optical and Functional Inorganic Materials ..... WEB page, CMS
  - Medical and Biological Engineering ..... WEB page, CMS
  - Visual pattern processing ..... WEB page, CMS
  - Applied Knowledge Systems ..... WEB page, CMS
- *Specialized Exercise and Experiments*
  - Advanced Exercise on Optical System Engineering ..... WEB page, CMS
  - Advanced Research on Optical System Engineering ..... WEB page, CMS