TUAT AIMS Programme 2014/15 Department of Mechanical Systems Engineering

Course Name [科目名]	Control Engineering
Instructor Name [教員]	Pongsathorn Raksincharoensak
Course Structure [授業形態]	Lecture and Exercise
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Fall semester in 2014, 90min/class x 2 class/week,
Course Credits [単位数]	3
Course Overview [概要]	This course introduces the basic design theory of feedback control systems for linear dynamical systems. Several applications on automotive control as well as aircraft dynamics control are described based on control theories. Classical control and Modern control theories are introduced in the class. The theory of state observer and Kalman filtering are also introduced.
Course Key Words [キーワード]	Control theory, modern control, transfer function, state space, state estimation, identification
Academic Goal [目標]	Students are expected to understand the controller design procedure in order to realize the control objectives and accordingly be able to apply the basic theory of feedback control system on mechanical systems.
Course Schedule [授業内容]	Week1 Introduction to control engineering, technical terms. 2 Feedback control system characteristics 3 Root locus method, Frequency response 4 Stability 5 Transfer function method : Design of feedback control system 6 State-Space method, Servo System 7 State observer , Kalman Filtering Theory 8 System Identification 9 Robust Control 10 Applications on automotive control systems: Chassis Control
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	(1)Richard C. Dorf and Robert H. Bishop, Modern Control Systems, 11th edition, Pearson International Edition (2) Katsuhiko Ogata : Modern Control Engineering
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Attendance 10% ,Exercises 40%, Examination 50%
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	

Course Name [科目名]	Engineering Component Design
Instructor Name [教員]	IKEDA, Koji
Course Structure [授業形態]	Lecture and Exercise
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Fall semester in 2014, 90min/class x 2class/week,
Course Credits [単位数]	3
Course Overview [概要]	This course is purposely to give students knowledge of the designers needs in order to effectively help. The knowledge is about how the universe behaves and learned the role of how to begin the process of design. Students will also be expose into the application of machinery, extend it further and add to students knowledge about the universe. Among the topics considered in this course are the analysis of forces and the forces action on the component of machinery. Most of the design is a problem solving such as, shaft bolts, welding, and bearing to tailor the design. Airy's stress function is also introduced as a case study for stress analysis. As a proof of knowledge achievement, a task report is requested at the end of the semester.
Course Key Words [キーワード]	Machine element, materials, bolts, shaft, shaft coupling, bearings, lubrication, gears, welding, stress function
Academic Goal [目標]	By the end of the course, students should be able to: 1) classify properties of materials and materials for engineering use, 2) analyze and synthesise engineering knowledge in design of engineering devices, 3) convey the analysis results not only to team members but also to instructors, 4) presenting the idea of project based on specific case study.
Course Schedule [授業内容]	Week1: Introduction of mechanical design 1) basic functions of machines and significance of design 2) procedures of design and matters to be considered in design Week2: Basic knowledge of loading and deformation 1) concepts of force, strength, and stress-strain relation 2) loading types and their effect - static forces, dynamic forces, tension, compression, torsion, bending, etc. Week3: Selection of materials 1) characteristics of materials and classification 2) background of characteristic difference Week4: Bolted joint 1) introduction of bolted joint – helix, lead angle, and related expressions 2) analysis of forces and determination of bolt size Week5: Shaft and shaft coupling 1) introduction of shaft and shaft coupling – types and issues to be considered 2) analysis of forced and determination of shaft size Week6: Bearing

	1) introduction of bearing – types and issues to be considered 2) selection of bearing to fit service requirement Week7: Lubrication 1) introduction of lubrication – purpose and function 2) selection of lubricants and additives Week8: Gear 1) introduction of gear – types and cycloid/involute curve 2) gear dimension to fit service requirement Week9: Welding 1) introduction of welding – types and method 2) issues to be considered and inspection Week10: Airy's stress function 1) introduction of stress function 2) case study of stress analysis for loaded plate with a circular hole
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	Reference materials will be available by downloading prior each class
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	1) mini-test at each class (40%) 2) contribution at each class (30%) 3) final task report (30%)
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	(none)

Course Name [科目名]	Mechanics of Machines and Vibration
Instructor Name [教員]	
Office Hours and Contact Information [オフィスアワー、連絡先]	
Course Structure [授業形態]	Lecture and Exercise
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Fall semester in 2014, 90min/class x 2class/week,
Course Credits [単位数]	3
Course Overview [概要]	This course introduces the topic of vibrations which is a direct application of the principles of kinetics. In this course, the study of discrete systems is limited to those whose configurations are described with one displacement or angular variable. We will describe the free vibration of particles and forced vibration of particles which are subdivided into un-damped and damped motion categories. Then, we will discuss the vibration of rigid bodies. Finally, an energy approach to the solution of vibration problems and several applications relevant to mechanical machineries, e.g. motors, rotational machines, etc. including vibration measurement and control are also introduced.
Course Key Words [キーワード]	Vibration, mode analysis, natural frequency,
Academic Goal [目標]	1. The students can derive the equation of motion of the one(multi)-degree-of-freedom mass spring damper system and find the solutions. 2. The students can calculate the natural frequency and the damping ratio of free vibration system. 3. The students can calculate the magnification ratio of the forced vibration system including the applications of the mechanical machineries. 4. The students understand the principle of seismic instruments and the automotive suspension vibration characteristics and vibration control.
Course Schedule [授業内容]	Week 1 : Free vibrations of particles. 2. Free vibration of rigid bodies. 3. Energy Method 4. Midterm Exam 5. Forced vibrations (undamped) 6. Forced vibrations (damped) 7. Transmissibility and Applications 8. Seismic Instruments 9. Vibration Analysis : Fourier Transformation, etc. 10. Automotive Suspension and Control
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	Engineering Mechanics:Dynamics, Meriam and Kraige Vector Mechanics for Engineers:Dynamics, Beer, Johnston, Cornwell
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Attendance and Exercises 20%, Examinations 80 %
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	

Course Name [科目名]	Laboratory II
Instructor Name [教員]	Nishizawa, Bei, Saito, Sato, Nishida, Iwami, Ueda
Office Hours and Contact Information [オフィスアワー、連絡先]	
Course Structure [授業形態]	Experiment (Laboratory Work) and Laboratory Tour
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Fall semester in 2014, 90min/class x 3class/week,
Course Credits [単位数]	1
Course Overview [概要]	Thermodynamics and Fluid dynamics are core subjects on Mechanical Engineering. These have developed though many experiments. In this course, students will learn the experimental method on thermofluid dynamics and perform experiments. Furthermore they will a visit thermofluid dynamics laboratory so as to have an experience with the most-advanced research in the field .
Course Key Words [キーワード]	Experiment, thermodynamics, fluid dynamics
Academic Goal [目標]	Obtain the skill to perform experiments Learn how to write a scientific report
Course Schedule [授業内容]	week1: Introduction week2:Measurement of temperature of fluid: thermocouple (experiment) week3: Flow in a circular tube: laminar flow and turbulent flow (experiment) week4: Plasma-fluid control: technology for space engines (lab. tour) week5: Characterization of mechanical bearing (experiment) week6:Performance evaluation of air conditioner week7: MEMS (lab. tour) week8: thermoacoustic refrigerator : heat pump driven by acoustic wave (experiment)
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Report about each week
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	

Course Name [科目名]	Mechanical Systems Laboratory Project
Instructor Name [教員]	IKEDA, Koji (Supervisor will be assigned after student is fixed)
Office Hours and Contact Information [オフィスアワー、連絡先]	
Course Structure [授業形態]	Seminar and laboratory work
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Fall semester in 2014, 90min/class x 2class/week,
Course Credits [単位数]	2
Course Overview [概要]	This course is intended to experience the final project activity of Japanese University style. The participant is allocated to one laboratory according to the matching between his/her interest and laboratory condition. The experimental / research activities will be carried out on the given / discussed subject. Laboratory will be assigned by discussion with the student after he/she comes to Japan by this program.
Course Key Words [キーワード]	Planning, Experiment, Data analysis, Discussion, Presentation
Academic Goal [目標]	1. able to operate the basic experimental apparatus, 2. able to acquire the meaningful experimental data 3. able to plan and discuss for assigned research
Course Schedule [授業内容]	Week1 : Introduction of project and discussion(1), demonstration of experimental apparatus (1) Week2 : Demonstration of experimental apparatus (2) and discussion(1) Week3 : Data acquisition(1), data analysis (1) and discussion(2) Week4 : Data acquisition(2) , data analysis (2) Week5 : Data acquisition(3) , data analysis (3) and preparation for presentation Week6 : Discussion(3) and intermediate presentation Week7 : Data acquisition(4) , data analysis (4) Week8 : Data acquisition(5) , data analysis (5) and discussion(4) Week9 : Discussion(5) and preparation for final presentation Week10 : Final presentation and discussion(6)
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	Nothing especially (if needed, reference will be provided from supervisor)
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]	Participation in experiment (25%), Participation in data analysis (25%), Participation in discussion (25%), Presentation (25%)
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	(none)

Course Name [科目名]	Advances in Mechanical Systems Engineering
Instructor Name [教員]	Ten Professors in different fields of Mechanical Systems Engineering (in omnibus style)
Course Structure [授業形態]	Lecture
Term, Meeting Days, Time and Location [開講時期、時間、場所]	Fall semester in 2014, 90min/class x 1class/week,
Course Credits [単位数]	2
Course Overview [概要]	Mechanical Systems Engineering is one of the key approaches to solve the current problems where keywords are “safe and secure”, “quality of life”, “clean environment”, “supply of food and energy”, etc. In this course, each lectures is selected from each significant field in mechanical systems engineering, provided by the professors of department of mechanical systems engineering, and also including a researcher from an external institute. * This course is a part of the course for Japanese students who take this course over 14weeks. Then there is a possibility for alternative topics from the list below depending on the arrangement of lectures.
Course Key Words [キーワード]	Mechanical Systems Engineering, Advanced Concepts, Advanced Approaches
Academic Goal [目標]	1. able to have a knowledge for the approaches in mechanical systems engineering to solve the problems, 2. able to have a knowledge behind the approaches in mechanical systems engineering to solve the problems, 3. understand the importance of basic knowledges in mechanical systems engineering to solve the problems
Course Schedule [授業内容]	Week1: Recent Topics in Nanotechnology: Renewable energy generation and advanced microfabrication Week2: Advances in Die & Mold Technology Week3: Active Vibration Control of Structures Week4: Mobile Robot Olfaction Week5: Car-Robotics Technology for Enhancing Active Safety Week6: Recent Topics in Plasma Propulsion Week7: Introduction to Mechanics of Solids and Some Recent Topics Week8: Connecting Advanced Technology in Vehicle Design and Manufacturing Companies to Customer and Business Needs Through a Strategic Framework of Deployment Week9: Bubbles, Drops and Particles - Fundamentals of Multiphase Flow Week10: Theory of Plasticity and Its Application to Industrial Forming Problems *This list is the topics in 2013. Some topics may be revised in 2014.
Textbooks, References, and Supplementary Materials [テキスト、参考書、その他]	Nothing especially (if needed, reference will be provided from supervisor)
Grading Philosophy (Percentage / Criteria / Methodology) [成績評価の方法]Attendance at classes: 50 points if attending more than 10 classes, or 5 points per class.	Attendance at classes: 50 % Submission of summary paper: 50%. Submit a summary paper containing the following contents via e-mail. The dead line and the submission address will be announced at the beginning of the semester. The paper should not exceed 4 pages of A4 paper. (Task 1) Provide a short description on what you have learned from each lecture. (Task 2) Provide your opinion/impression/comments on this subject. For Task 1, comprehensive descriptions without logical/grammatical errors are required. For Task 2, reasonable amount of description is required.
Other (i.e. Expectations on Classroom Conduct and Decorum etc.) [その他]	(none)