Descriptions of Courses

SPE510 Space Mission and Orbit Analysis
This course covers space mission design and orbit analysis. Target spacecraft include earth observation satellites, geostationary and solar system exploration satellites. For such a goal, basic analysis on mission requirements and procedures to meet the requirements will be discussed with fundamental orbit analysis.

SPE520 Introduction to Spacecraft Engineering
This course covers basics on spacecraft engineering. Basic mission analysis, and introduction to sub-systems are discussed. In addition, launch trajectory analysis, docking systems and reentry dynamics are introduced. Different sensors onboard the spacecraft will be studied also.

SPE530 Spacecraft Mechanical Systems
Various spacecraft mechanical systems design will be covered in this course. Not only bus system, but also payload systems design will be discussed with special focus on composite material technology which has shown many space applications in recent decades.

SPE532 Spacecraft Thermal Control
In this course, introduction to spacecraft thermal control is presented. Radiation theory in space, and actual thermal analysis example will be provided to help understanding on spacecraft thermal control. Both passive and active thermal control approaches will be discussed.

SPE536 Spacecraft Power System Design
Power requirement analysis to meet mission objectives and associated power control system design approach will be presented. Especially, recent power system design methods will be investigated in detail.

SPE538 Spacecraft Onboard Computer System
Basics on high reliability onboard computers design will be covered. Recent trends on spacecraft onboard computers and detailed design aspects will be presented also. Furthermore, overview on onboard flight software with recent trends is another subject of this course.

SPE540 Spacecraft Communication System
In this course, we will cover fundamentals of spacecraft communication systems design. For this goal, basic requirements and elements of low earth orbit and deep space spacecraft communication will be presented in detail. With virtual mission scenarios, an attempt will be made to design communication system to meet such mission scenarios.

SPE542 Spacecraft Control System
Attitude control system analysis and actual design will be covered in this course. Both single-axis and three-axis attitude control modes will be simulated with various guidance algorithms. For design study, interface between sensors and actuators will be covered.

SPE546 Spacecraft Propulsion System
Basics on spacecraft propulsion system and various actual propulsion system examples will be presented. In addition to conventional mono or bi-propellant propulsion systems, electrical thrusters will be introduced. Actual mono-propulsion systems are demonstrated during the class.

SPE560 Space Observation Payloads and Applications I
Basic operational principles and detailed design aspects of optical and infrared payloads for space exploration will be presented in this course.

SPE562 Space Observation Payloads and Applications II
Various space payloads such as spectrometers, laser altimeter, radar altimeter, X-ray analyzer will be covered with detailed analysis on each payload. Data processing approaches will be also provided.

SPE564 Spacecraft Optical Systems
Principles and analysis on parameters determining performance of space payload will be studied. Targe payload

system will be given for students to build up practical experience on payload systems design.

SPE566 Space Remote Sensing I
Understand basic principles on space remote sensing, and study data processing algorithms with different payload equipments.

SPE568 Space Remote Sensing II
In this course, complete steps for space remote sensing will be taken by using actual remote sensing data. Both ground and ocean measurement data will be used to learn advanced remote sensing technology. Furthermore, application of remote sensing technology to space exploration missions will be introduced.

CS530 Operating System
The main focus of this course is to understand the concurrency features of modern operating systems. Concurrent programming is dealt with in detail to simulate various parts of an OS. Other topics that are required to understand the process-oriented OS structure are also discussed.

EE413 Networking Design and Programming
This is an introductory networking course based on the Cisco Networking Academy Program and provides knowledge and practical experience with the design, configuration, management, and maintenance of computer networks. Topics include OSI 7-layer architectures, cabling, Ethernet, routing, TCP / IP protocols, IP addressing, routing protocols, WANs, network troubleshooting, and access control lists.

EE421 Wireless Communication Systems
This course emphasizes practical implementation aspects of digital communication systems. A physical-layer software implementation project will be assigned for a selected commercially-deployed communication system. Topics covered in this digital communication course include : (1) Digital modulation and demodulation, Optimum receivers, (2) Adaptive equalization and Synchronization, (3) Channel capacity, Error control codes.
(Prerequisite: EE321)

EE432 Digital Signal Processing
This course studies the representation, analysis, and design of discrete-time signals and systems. Topics include a review of the z-transform and the discrete Fourier transform, the fast Fourier transform, digital filter structures, digital filter design techniques, analog-to-digital and digital-to-analog data conversion, rate conversion, sampling and aliasing issues.
(Prerequisite: EE202)

EE535 Digital Image Processing
This course deals with the fundamental concept of digital image processing, analysis, and understanding. Topics include sampling, linear and nonlinear operations of images, image compression, enhancement and restoration, reconstruction from projections, feature extraction, and image understanding.

EE542 Microwave Engineering
This course is designed to provide in-depth understanding and knowledge on the theory and applications of microwave circuits, components, and systems used in Microwave and RF wireless communication systems.
(Prerequisite: EE204)

EE567 Photovoltaic Power Generation
In this course, various photovoltaic devices and systems are introduced. This course deals with basic theory of solar cells, the structures and characteristics of various solar cells, and the recent R&D trend and future prospects of photovoltaic technologies.
(Prerequisites: EE302)

EE571 Advanced Electronic Circuits
This course introduces new analysis methods for analog-circuits implemented by using bipolar and MOS transistors. Since the design of analog circuit requires both approximation and creativity, this course explains how to approximate and design complicated circuits.
(Prerequisites: EE206, EE301)

EE581 Linear Systems
Topics include system representation (input-output description, state variable description), solutions of linear dynamical equations, controllability and observability, irreducible realization, stability (BIBO stability, Lyapunov stability) for rigorous treatment of linear systems. In addition, feedback linearization is to be covered.

EE594 Power Electronics Systems
This course covers the design and analysis of the topology about the DC / DC converter, PFC (Power Factor Correction) circuit and control methode in that topology. Also the topology such as inverter, resonant converter, and active power filter is introduced, and the control algorithm of that topology is studied in this course. Finally the state of the art in power conversion system is discussed, and every student carries out a term project about design and modeling of power supply. On completion of this course students will have built confidence on their ability to design and analyse the power conversion system.
(Prerequisite: EE391)

EE681 Nonlinear Control
This course is intended to present the fundamental result of analysis and design of nonlinear control systems. Especially, this course is concerned with the analysis tools for nonlinear dynamical systems and the design techniques for nonlinear control systems.
(Prerequisite: EE581)

IE525 Project Management
The course deals with project management concepts, scheduling models and algorithms, work breakdown structure, project management processes, project management systems, and their applications to engineering projects and SW development / system integration projects.

IE634 Reliability and Maintenance Engineering
The purpose of this course is to develop mathematical models and methods of solving problems in producing, estimating, or optimizing the probability of survival of components or systems with special emphasis on the applications to the maintenance and replacement decision-making. Among the major topics covered are: concept and definition of reliability; failure distributions and reliability functions; reliability of parallel systems; reliability of stand-by systems; system maintenance, availability and dependability; reliability design considerations; components and system reliability measurements; implementation of reliability.

MAE500 Mathematical Methods in Mechanical Engineering
Basic mathematical skill, matrix, linear equation, linear space will be covered to study mechanical engineering.

MAE502 Introduction to Finite Element Method
Finite element method to solve a differential equation.

MAE505 Measurement Instrumentation
Basic principles, concepts, and methods of measurement instrumentation of physical quantities dealt with significance in mechanical engineering are introduced. Emphasis is given to the measurements of lengths, forces, and temperature with mechanical, electromagnet, and optical instrumentation technologies.

MAE512 Advanced Heat Transfer
The aims of this course are to give the students more concrete understanding of basic ideas of heat transfer and to enable them to design actually applicable devices. Brief introduction to recent research topics will be added at the end. There will be a few homework assignments.

MAE518 Rocket System Engineering
Elementary principles of the rocket propulsion system are taught in this lecture. This course is offered for senior level undergraduate and 1st year master program students majoring aerospace engineering and mechanical engineering. Students will practice design calculation to apply basic principles of fluid mechanics and heat transfer to this calculation. The lecture will cover issues of maximum velocity, acceleration, total impulse and derivation of performance parameters from thrust chamber data.

MAE542 Mechanics of Composite Materials
This course covers the following topics: Classification and characteristics of composite materials; strain-stress relations of anisotropic materials; classical laminate theory; analysis of symmetric and unsymmetric laminate; interlaminar stress; failure criteria of composite; mechanical testing methods and applications.

MAE550 Advanced Dynamics
Kinematics of two and three dimensional motions of rigid bodies are started with as well as particle motions. An efficient and systematic method for derivation of equations of motion of such a system is studied based on Kane's approach. The most fundamental law, i.e., Newton's 2nd law and other advanced dynamic(Hamilton and Lagrange) equations are covered as well for comparison purpose.

MAE551 Linear Vibration
Beginning with linear system theory, principles in advanced dynamics are introduced. Then, single and multiple degree-of-freedom(DOF) systems are covered. Relevance of eigenvalue problems to multiple DOF system analysis is introduced together with some numerical techniques. How to deal with distributed systems such as string, rod, beam, membrane and plate is covered for simple geometries. Numerical approximation techniques for the distributed systems are studied finally.

MAE553 Robot Dynamics
To develop an understanding and facility with the basic analytical tools for the analysis and design of multi-body dynamic systems through robotic manipulators.

MAE561 Linear System Control
Designed to enable graduate students to make analysis of a given linear system in terms of stability, controllability and observability, and to design a linear controller by using eigenstructure assignment

MAE563 Microprocessor Application
Designed to give graduate students the ability to understand basic principles of microprocessors and their applications in modern product designs. Prerequisites by topics: basic electrical circuits, computer languages.

MAE566 Spacecraft Trajectory Guidance and Control
In this course, spacecraft orbit guidance and control problems are discussed. Detailed analysis on guidance and control techniques necessary for mission operations from the launch phase is covered. In particular, lectures are given in the areas such as spacecraft rendezvous and docking, formation flying, inter-planetary mission analysis, optimal orbital maneuver, and guidance and control of reentry vehicles. Simulation study is also paralleled with lectures to provide practical experience.

MAE595 Introduction to Optimal Flight Control
In this course, classical optimal control theory is introduced. Then, various practical optimization algorithms are introduced and applied to trajectory optimization and flight control design. Students are supposed to develop the code by themselves. Emphasis will be given to formulation of optimization problems and numerical efficiency of algorithms such as convergence characteristics.

MAE 597 Spacecraft Attitude Dynamics and Control
Advanced spacecraft attitude dynamics and control subjects are covered in this course. Classical dynamics approach are introduced to establish a variety of spacecraft attitude dynamics problems. Different attitude kinematics are also discussed to provide thorough understanding on the description of attitude dynamics and kinematics modelling. Attitude control problems using on-off thrusters are explained with simulation results. Recent developments in thruster modulation techniques are addressed. Flexible spacecraft modelling and control law design are presented to provide basic knowledge on recent advances in large spacecraft modeling and control technologies.

MAE726 Equilibrium Hypersonic Aerothermodynamics
This course deals with the basic concepts of thermochemical phenomena occurring in hypersonic flight. Learns the basic principles of atoms, molecules, quantum mechanics, statistical mechanics, radiation, and spectroscopy related to the equilibrium state in hypersonic flows, and computational methods.

MAE728 Reentry Aerothermodynamics
This course deals with the heat transfer phenomena, ablation phenomena of the thermal protection systems, and methods of testing thermal protection systems. Beginning with the theory of boundary layers in hypersonic flight, one learns the phenomena occurring at the surface of the thermal protection system, the phenomena occurring inside the thermal protection system, shock tubes, arc-heated wind tunnels, and ballistic ranges.

MAE761 Nonlinear System Control
This course deals with the contents about the nonlinear system and nonlinear controller widely. Those contents involve the analysis, stability, controller design for the nonlinear system and design, analysis for the nonlinear controllers.

MAE860 Special Topics in Propulsion and Combustion
Advanced and contemporary theories and their applications in the field of propulsion and combustion that are not adequate to be included in a regular class are covered in this lecture.

MAE890 Special Topics in Aerospace Engineering
Theories which are not covered in regular class in the field of aerospace engineering are taught in this course. This course also introduces current research activities and references.

PH481 Astrophysics
This course is designed to help students understand the astronomical phenomena in terms of basic physical principles. Topics include the physical properties of interstellar medium, stellar structure and evolution, structure and dynamical evolution of galaxies, and theories of cosmological evolution.
(Prerequisites: PH232, PH312)

PH441 Introduction to Plasma Physics
This course is designed to help students build their ability to understand basic plasma concepts. Topics include discharge processes and application of plasmas, motion of charged particles in electric and magnetic fields, plasmas as fluids (magnetohydrodynamics), diffusion in weakly and fully ionized plasmas, waves in fluid plasmas, and kinetic theory and nonlinear effects.
(Prerequisites: Electromagnetism)

PH622 Geometrical Optics
This course is designed to teach general concepts on Gaussian optics, Seidel first order aberration theory, and optical design method. Methods of optical testing are also reviewed.
(Recommended Prerequisites: Introductory of optics, Introductory on wave optics.)