Descriptions of Courses

RE510   Intelligent Robot Design Lab
This course will provide the methodology of designing and developing an intelligent robot. The objective of this course is to give students a chance to build their own intelligent robot system and demonstrate it. For example, Design and implementation of mobile robot will be performed including procerssor, actuators, sensors, vision, software, and system integration.

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.

EE683   Robot Control
This course is intended to cover kinematics, dynamics and control algorithm of robot manipulator. After covering homogeneous transformations, kinematics equations, motion trajectory planning, we will handle various control methods. We will compare the utilization of these control methods through simulation.

CS510   Computer Architecture
This goal of this course is to provide the student with an understanding of (i) the architectural aspect of the performance issues, and (ii) investigation of the full spectrum of design alternatives and their trade-offs.

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

MAE655   Robotics Engineering
This course is designed to enable graduate students to understand the most updated topics in kinematics and dynamics of robotics and to apply recently introduced control techniques.

RE502   Sensor & Sensing
Sensor technology is one of the essential components in modern intelligent robot technology. This course first reviews some of the classical sensors including location, tactile, laser, and ultrasound sensors. Then, this course mainly focuses on in depth discussion on modern imaging sensor technologies such photodetecors, CCD, CMOS, etc.

RE530   Sensor-based Mobile Robots
In this course, various sensors for mobile robots are introduced, interfacing and system integration technologies are surveyed. Using these sensors, dead reckoning, localization, and map building techniques are studied. Recent topics including motor, encoder, ultrasonic sensor, laser sensor, miscellaneous sensors, interfacing technology, system integration, networking, distributed sensors, and new sensor technology.

RE540   Robot Vision and Sensing
This course describes robot vision technology and other sensing modalities for the perception of an intelligent robot. Specifically, the principles and applications of 3-D vision sensing by multiple CCD cameras will be treated in depth as well as other active range sensing techniques, such as laser range finder, sonar, and RF sensor network.

RE610   Network-based Robotics
This course describes networked environing sensing and actuation, intelligence and control of distributed system, including consistent interaction among man and robot and multi components of the environment. Covered topics include human-robot symbiosis, networked human-robot interaction, network intelligence, reconfigurable software architecture, software platform and standards, networked mobile robots, heterogeneous multi-robot coordination, robot security, and networked-robot applications.

RE710   Artificial Life
This course describes the relationship between the artificial life, artificial intelligence and the intelligence control, and deals with the evolution of the artificial creatures, artificial life & emotion and the problem of the artificial life. Artificial sense organs and brain in the application field accompanied with the IT technology will also be studied. Especially, various parts of the applied robot system including the Humanoid robot will be further discussed for the upcoming robot system.

RE720   Humanoid Robot
This course deals with stable dynamic walking technology of a humanoid robot and its implementation. Kinematics and dynamics of humanoid robot are introduced and ZMP stability is studied as well. Various walking pattern making algorithm is studied in detail, and robot control methods which are indispensable for stable walking are explained in this course.

RE722   Robot Vision and Digital Image System
Through the investigation on the robot intelligence area and the implementations of various robot vision systems which are being practically applied, students learn how to use/apply the developed technologies. Finally, this course encourages students to be experts who are able to develop a creative robot vision system.

RE730   Micro/Nano Robotics
As NT(Nano Technology) and BT(Bio Technology) are advancing gradually in 21C, the new concept of Micro/Nano Robotics are created by combining Micro robotics with the NT/BT. This course is designed to give an overview of basic technology and recent developments in the micro/nano robotics, and to practice the realization of new ideas related to this course through the development experiments.

RE740   Evolutionary Robotics
The course deals with the imaginary evolution method of the robot. Related to this, it covers the evolutionary programming, genetic algorithm and design of the fitness function. Strengthening learning method like Q-learning for robots, robot language for interacting with users, the possibility of implementing thoughts and consciousness will be introduced to deal with the evolution, progress, learning and reproduction of the robot.

RE887   Special Topics on Robot Technology
This course is designed to be a survey, presentation, discussion, invited talk, panel discussion and project about selected subjects concerning on 21C intelligence robot technology and its major application fields. Main topics will be humanoid robotics, ubiquitous robotics, HRI, neuro-informatics, applications of intelligent robot and so on.

GT508   Green Air Transportation System and Green Aviation
Introductory course on green air transportation system and green aviation. Topics included in the class are elements civil aviation system; air traffic management; communication, surveillance, navigation; aircraft characteristics and performances; aviation safety; airlines industry; airport planning and operations; environmental impact of aviation; policy and engineering techniques for sustainable air transportation;

innovative ideas for green air transportation

MAS565   Numerical Analysis
This course introduces computational linear algebra and finite differential methods. It also provides a basic foundation in numerical methods for scientific computation. Topics include matrix computation, Gaussian elimination, Choleski decomposition, LU decomposition, banded system block tridiagonal systems, the Gauss-Seidel method, the Jacobi method, block interaction, error analysis, interpolation theory, the approximation of functions, root-finding for nonlinear equations, numerical differentiation and integration, and stability.

IE561   Advanced Information System Engineering
This course introduces principles of analysis and design of management information and control systems and reviews current tools and techniques in software engineering to support industrial activities. In addition, models of human-computer interaction, interface design problems, and interactive optimization are considered from the systems engineering point of view.

IE761   Cognitive Systems Engineering
Approaches to enhance human performance in problem solving and decision making by computer and other methods are considered. Systems engineering point of view is exercised while covering models of human and machine intelligence, prescriptive and descriptive theories of human decision making, and models to combine human and machine resources. Application-oriented issues are emphasized.

ID506   Media Interaction Design
This course is designed to study the interactivity of multi-modalities (visual, sound, olfactory, and tactile), and to experience creative interaction design. Emphasis is given to experience tangible interface design with the state-of-the-art of interactive technology.

ID706   Theory of Interface Design
This is an advanced lecture course to study general theories for interface design including human cognitive model, interface design guideline, research methods. Students are to learn interface as a system consisted of human, product, and interface. This interface is viewed in diverse perspectives including intelligent, emotional, social and cultural interface. Final deliverable for student is publication of a paper in a related journal or conference.

EE414   Embedded Systems
In this lecture, various hardware and software components and system implementation aspects of embedded system are covered.   Covered topics inlcude bus-based expandable ARM processor based board, open-source embedded Linux operating system, PC-based software development environment, digital and analog interface techniques, ARM assembly language, device drivers. Hands-on experience is gained to enhance firm understanding.
(Prerequisite: EE203)

EE481   Intelligent Systems
Two major themes of this course are 'Modern Control System' and 'Computational Intelligence'.   Each lecture will address a balanced emphasis on the theory about the control system and its applications in practice.   The first part of this course includes digital control system design and state-space methods for control system design. The basic system identification scheme will also be included, considering the control of unknown systems. Once background knowledge of the modern control system is established, this course will then focus on the second part composed of computational intelligence using fuzzy logic, artificial neural network and evolutionary computation as main topics to introduce recent trend in intelligent control.

Term projects will be assigned to test the algorithms to the given problems.
(Prerequisites: EE202, EE381)

EE516   Computer Applications Lab.
In this course, the fundamental commands and the Kernel programming of Linux OS will be practiced on a ARM based embedded computer. It covers the system call generation, the module programming, and the programming of character device drivers, block device drivers, and interrupt handling.

EE531   Statistical Learning Theory
Introduce students the fundamental concepts and intuition behind modern machine learning techniques and algorithms, beginning with topics such as perceptron to more recent topics such as boosting, support vector machines and Bayesian networks. Statistical inference will be the foundation for most the algorithms covered in the course.

EE533   Digital Speech Processing
This course explains how digital signal processing techniques can be applied in the field of Robot-Human communication using speech. The initial part of the course covers some background material in signal processing and the acoustic theory of speech production. The latter parts cover coding, recognition and synthesis of speech.

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.

EE538   Neural Networks
This course covers the theory and application of neural networks. In particular lectures explore the structure and function of neural networks and their learning and generalization. Also various models of neural networks and their applications are illustrated.

EE573   Introduction to VLSI Systems
This course covers the role, application and various issues in the design and verification of various VLSI chips including SoC (System-on-Chip). Additional topics include HW / SW co-design and co-verification, full-custom design, reconfigurable systems, low-power system, interconnection and packaging, clock distribution, VDSM (Very Deep Submicron) issues. Students will be given two opportunities for poster and oral presentations, respectively, on the topic of his / her choice within the course subject.

EE582   Digital Control
This course describes the analysis and design of digital control systems. Sampling and data reconstruction and Z-transform in computer control system will be covered. Analysis and design of digital control systems using frequency domain techniques will be introduced. Also, design of the digital control system using state space approaches will be covered. As a term project, a real-time digital control system will be implemented on a microprocessor system.

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)

EE667   Multiple View Geometry
This course deals with fundamental concepts of multiple view geometry for 3D computer vision, such as projective geometry, transformation, estimation of the transformation parameters, camera model and camera matrix, epipolar geometry, fundamental matrix, trifocal tensor, and 3D structure computation, and so on.

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)

EE682   Intelligent Control Theory
Among the various well-known intelligent control techniques, the methods of fuzzy control and neural net-based learning control are first introduced to allow for handling ambiguous / uncertain situations and effective supervised learning, respectively. Specifically, the theory of fuzzy sets and fuzzy logic-based inference mechanism are studied and the design techniques of fuzzy control are introduced. Then, the neural net learning structure is discussed and the control system based on the artificial neural nets is studied. Fuzzy-neuro systems are also considered. In the second part of the course work, some other computational intelligence techniques such as GA and the rough set are briefly covered and then the basic machine learning techniques and the reinforcement learning method are studied in conjunction with the their use in control system design. (Prerequisite: EE581)

EE686   Optimization Theory
This course deals with optimization theories to solve problems in engineering, economics, management, and other practical applications. Classical methods based on geometry through linear vector space and function analysis are studied. Also optimization methods based on evolutionary computation and neural network are dealt with as an advanced technology. The contents include linear planning, nonlinear planning, dynamic planning, function optimization, least squares method, etc.
(Prerequisite: EE581)

EE688   Optimal Control Theory
This course deals with the derivation of maximum principle and the design of optimal control system. It includes an optimal design method for minimum time and energy along with dynamic programming and discrete maximum principle. Also advanced topics of optimal control are introduced. (Prerequisite: EE581)

EE734   Image Understanding
This course explores the theory and methodologies used to interpret images and videos in terms of semantic content. Techniques from pattern recognition are introduced and discussed to explain how to apply them for image understanding.
(Prerequisite: EE535)

EE735   Computer Vision
This course will explore the principles, models and applications of computer vision. The course consists of five parts: image formation and image models; generic features, such as edges and corners, from images; the multiple view analysis to recover three dimensional structure from images; segmentation of images and tracking; the object recognition methodologies. (Prerequisite: EE535)

EE737   Imaging Systems
This course is designed to introduce several medical image systems and the related applications based on various image processing techniques. Topics include image reconstruction algorithms, X-ray CT, single photon emission CT, positron emission tomography, magnetic resonance imaging, ultrasound imaging, and related post processing techniques.

EE739   Cognitive Information Processing
This course discusses cognitive information processing mechanism in our brain and computational models for human-like cognitive systems. We will first discuss neural data representation, and move to the models of perception, attention, socialization, memory, learning, reasoning, and problem solving.

EE788   Robot Cognition and Planning
This course deals with sensor fusion, decision making and information procession on real time for intelligent robots. To have a higher level of cognition, advanced level of problem solving methods are presented for task planning, scheduling and navigation planning. (Prerequisite: EE682, EE683)

EE837   Special Topics in Signal Processing
This course is to introduce some important topics in the general area of communications and signal processing. Topics may vary from year to year.

EE838   Special Topics in Image Engineering
This course introduces a selected topics of recent technologies and algorithm related to image processing and imaging systems.
(Prerequisite: EE432, EE535)

EE887   Special Topics in Robotics
This course covers topics of interest in robotics for graduate level students. Course content is specifically designed by the instructor.

CS470   Introduction to Artificial Intelligence
This course introduces basic concepts and design techniques of artificial intelligence, and later deals with knowledge representation and inference techniques. Students are to design, implement, and train knowledge-based systems.

CS520   Theory of Programming Languages
This course reviews design principles and implementation techniques of various programming languages. This course also introduces a wide spectrum of programming paradigms such as functional programming, logic programming, and object-oriented programming.

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.

CS540   Network Architecture
The goal of this course is to provide students with an understanding on the following topics. (1) the concept of layered architectures, (2) the design and implementation of communication protocols, (3) the multimedia communication protocol, and (4) the design of high-speed protocols. The course also covers many aspects of protocol engineering: design, implementation and test of communication protocols.

CS543   Distributed Systems
This course provides theoretical knowledge and hands-on experience with distributed systems' design and implementation. The course will focus on the principles underlying modern distributed systems such as networking, naming, security, distributed sychronization, concurrency, fault tolerance, etc. along with case studies. Emphasis will be on evaluating and critiquing approaches and ideas.
(Prerequisite: CS510, CS530)

CS570   Artificial Intelligence
The goal of this course is to give both a comprehensive introduction to core concepts of AI and hands-on experience in symbolic language programming. This course not only provides a thorough discussion of AI's foundational technologies including predicate calculus, search, and AI languages, but introduces processing, pattern recognition, computer vision, and neural networks.

CS572   Artificial Intelligence
The goal of this course is to give both a comprehensive introduction to core concepts of AI and hands-on experience in symbolic language programming. This course not only provides a thorough discussion of AI's foundational technologies including predicate calculus, search, and AI languages, but introduces processing, pattern recognition, computer vision, and neural networks.

CS576   Computer Vision
The goal of this course is to provide students with theory and application of computer vision. Major topics include digital image fundamentals, binary vision, gray-level vision, 3-D vision, motion detection and analysis, computer vision system hardware and architecture, CAD-based vision, knowledge-based vision, neural-network-based vision.

CS580   Interactive Computer Graphics
This course presents the principles of three-dimensional graphics, including geometric, modeling and realistic image synthesis. It also covers techniques for representing, manipulating, and rendering three-dimensional objects.

CS600   Graph Theory
This course is intended as a first course in graph theory. It covers the basic theory and applications of trees, networks, Euler graphs, Hamiltonian graphs, matchings, colorings, planar graphs, and network flow.

CS610   Parallel Processing
This course discusses both parallel software and parallel architectures. It starts with an overview of the basic foundations such as hardware technology, applications and, computational models. An overview of parallel software and their limitations is provided. Some existing parallel machines and proposed parallel architectures are also covered.

CS655   System Modeling and Analysis
Today's information systems are getting more complex, and need for automation systems is ever increasing. In this couse we address basic modelling methods in system analysis and study static and dynamic analysis of systems using Petri Net.

CS670   Fuzzy and Intelligent System
The aim of this course is to introduce basic concepts and knowledge of the fuzzy theory and its applications. This course also covers some important intelligent systems including the neural network model and genetic algorithm, and the fusion of the different techniques will be discussed.

CS672   Reinforcement Learning
This course covers reinforcement learning, which is one of the core research areas in machine learning and artificial intelligence. Reinforcement learning has various applications, such as robot navigation/control, intelligent user interfaces, and network routing. Students will be able to understand the fundamental concepts, and capture the recent research trends.

CS676   Pattern Recognition
Through this course, students are expected to acquire general ideas of pattern recognition and its application. Three fields (character, speech and image processing) will be studied in which pattern recognition techniques can be successfully applied.

CS686   Motion Planning and Applications
In this class we will discuss various techniques of motion and path planning for various robots. We go over various classic techniques such as visibility graphs and cell decomposition. In particular, we will study probabilistic techniques that have been used for a wide variety of robots and extensively investigated in recent years.

CS688   Large-Scale Image & Video Retrieval
In this class we will discuss various techniques related to image/video retrieval. Especially, we will go over image/video features (e.g., SIFTs and GISTs), their indexing data structures, and runtime query algorithms. We will also study scalable techniques that can handle large-scale image/video databases, in addition to looking into novel applications of them.

CS770   Topics in Computer Vision
This course consists of lectures about major topics related to computer vision, seminars, and projects. Recent major topics are motion detection and analysis, parallel computer vision systems, CAD-based 3-D vision, knowledge-based vision, neural network-based vision, etc.

CS774   Topics in Artificial Intelligence
This course covers advanced topics of interest in artificial intelligence.

CS776   Topics in Cognitive Science
This course is designed to cover topics of interest in cognitive science.

CS780   Topics in Interactive Computer Graphics
This course is designed to cover recent developments in interactive computer graphics.

CE551   Soft Computing Techniques for Engineering Design
This course deals with various soft computing techniques for solving various engineering and mechanical / structural design problems. This course puts emphasis on the most recent soft computing techniques such as neural networks, fuzzy logic and evolutionary computation (EC), and also deals with intelligent control schemes using such techniques.

CE558   Introduction to Civil Robotics
This course is targeted to familiarize graduate students with civil robotics. This course helps students understand general mobile robotics issues and apply robot techniques to their application area. Specifically the students can understand fundamental principles of mobile robotics by simulating their application worlds with robotics simulation tool such as Webots and MSRS (Microsoft Robotics Studio)

MAE453   Introduction to Robotics Engineering
In the robot motion, one will analyze the static and spatial restriction factors deal with basic robots design and application.

MAE465   Flight Dynamics and Control
In the beginning, students are introduced to equations of motion of aircraft, and to the linearized and decoupled equations. Various stability/control augmentation systems such as pitch attitude control, normal acceleration control, turn coordination, yaw damper are then treated. Guidance problems such as instrument landing and path tracking are also discussed with longitudinal and lateral autopilot.

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.

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.

MAE562   Digital System Control
This course introduces the basic concept of discrete time control in the time domain and the state space. the major results of control theory such as stability, observability, controllability, optimality, etc. will be reviewed for the discrete time case. some other contents included in this course are sampling theory, discrete modeling of the systems, discretization of continuous system, microprocessor applications, etc.

MAE563   Microprocessor Application
This course is 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.

MAE585   Mechanics and Control of Human Movement
This course covers methods for modeling and analyzing human movement as biomechanical systems. Topics to be covered include dynamics of body segments, kinematic analysis, forward dynamics simulations, inverse dynamics, control analysis, and muscle mechanics. The course also includes the topics on central nervous system as well as sensory organs.

MAE597   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.

MAE600   Mechanical System Design Project 1

MAE601   Mechanical System Design Project 2

MAE642   Biomechanics
Study the structure, function and its behavior of human musculo-skeletal system, identify the physical problem of musculo-skeletal system to find contribution in solving those problems applying mechanical principles.

MAE654   Noise Control
Various environmental pollutions are being concerned very much along with the fast development of industry and living standard. Among various pollution topics, 'noise', in particular from various mechanical systems, becomes a big concerning item to generals and manufacturers because the machine noise is usually directly related with the ordinary life of human beings. Quietness of machines becomes one of quality and market value evaluation points of a machine and the customers and regulations demand a lot of noise-related functions to the machine manufacturers. In this course, for the high value design of machines and the quietness of everyday life and environment, source characteristics, human perception characteristics, identification of noise sources and transfer paths, product sound quality, and countermeasure plans are studied, which should be in mind for a noise and vibration engineer.

MAE662   Design of Precision Actuation System
This course is designed for graduate students. In the beginning, design principles are introduced. Next, several structure design techniques such as kinematic design, flexture mechanism design, guide mechanism design, etc. are studied. Then, error analysis/compensation and uncertainty analysis are covered. In this course, every student proposes a term project and the result of the project is estimated by presentation at the end of the semester.

MAE664   Navigation and Guidance
In this class, fundamentals of inertial navigation and GPS are introduced, and detail algorithms of strapdown inertial navigation are also discussed. For integrated navigation, Kalman filtering is studied in depth. Guidance laws for aircraft en-route flight and missile systems are also reviewed. Students are expected to conduct extensive computer simulations of GPS / INS navigation systems.

MAE683   Human Robot Interaction: Haptics
As the human-robot interaction is becoming an important issue for the upcoming human-robot symbiosis era, this year's lecture course is extending the haptic interaction study in human-robot to multimodal interaction. Telerobotics and haptic interaction is the robotics research area that is related with transmission of force or tactile information about remote place or virtual model. The lecture will address fundamental topics about telerobotics and haptic interaction; bilateral control architecture, haptic devices, human haptic perception, haptic modeling, performance evaluation and related applications. Also, various topics in human-robot interaction will be lectured on by joint guest lecturers and with Prof. Kwon.

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 nonlinear system and design, analysis for nonlinear controllers.

BiS571   BioElectroMechanics
This course provides electromechanics for understanding and analysis of biomechatronic systems. An analogy between mechanical systems and electrical systems, modeling of electromechanical systems, and working principles of biomedical, diagnostic, surgery and therapeutic equipments are discussed.

BiS651   Hearing and Auditory Model
We study basic concepts of acoustic wave propagation and scattering, and human auditory systems based

on cognitive, acoustic, and signal processing perspectives. By analysing huge amounts of cognitive science experimental data, we propose mathematical models for non-linearity, time-adaptation, masking, etc. Also, the connection of this data to information theory is investigated, and finally, applications to speech recognition are studied.

BiS652   Human Visual Model
Human visual system is studied with cognitive scientific and signal processing perspectives. By analysing huge cognitive science experimental data, we will come up to mathematical models. Also, its connection to information theory is investigated, and finally applications to real-world image recognition and target tracking are studied.

BiS653   Biomedical Imaging System
Theory and applications of several biomedical imaging systems are studied. Especially, X-ray imaging, ultra-acoustic imaging, X-ray CT, MRI, PET, and PACS are discussed.

BiS673   Bioelectronic Devices
This course covers advanced topics in the design and industrial application of bioelectronic devices such as biosensor and biochip. The fundamental principles in these areas have emphasized to understand the biological recognition mechanism of enzyme, antibody, microorganism, animal cell, and DNA.

OSE543. Dynamics and Control of Ocean Vehicles
This course offers a comprehensive overview of dynamic modeling, analysis and control system design for ocean vehicles. It will provide students a theoretical foundation and understanding of the concepts involved in classical and modern control theories which can be applied to all types of ocean vehicles including surface vessels and manned/unmanned underwater vehicles. The topics of this course include: kinematics, rigid body dynamics, vehicle dynamics modeling, stability/controllability analysis, introductory control and estimation techniques, and some specific control application examples.

OSE643 Ocean Robotics: Techniques and Application
Fundamental concepts and design principles of underwater robotic systems are introduced, and various mathematical techniques and algorithms for autonomous or teleoperated underwater vehicles are presented. The specific topics of this course include vehicle guidance and path planning, precision navigation in a GPS-denied environment, control algorithms and practical controller design methods, probabilistic robotic techniques for underwater applications, etc.

RE960   Thesis Research(Master)

RE966   Seminar(Master)

RE980   Thesis Research(Doctoral)

RE986   Seminar(Doctoral)