Mechanical System Engineering

Course title	Course description	Instructor
材料力学特論 Advanced Mechanics of Materials	This course teaches fundamental solid mechanics theory. The contents cover continuum theories of elasticity and plasticity, and related fundamental mathematics. In addition, metal crystal structure and deformation mechanism are provided as related topics.	村澤　剛 Go MURASAWA 久米裕二 Yuji KUME
振動工学特論 Topics in Engineering Vibration	In order to understand the characteristics of vibrating structures it is necessary to be able to develop, independently, a mathematical model of any problem at hand. Starting from the one degree-of-freedom problems studied in the undergraduate vibration course, we will here move on first to problems with multiple degrees of freedom and then to problems of vibrating continua, such as strings and beams. Topics such as Hamilton's equations of motion and eigenvalue problems are considered as well.	ランジェム　ミカエル M, Mikael LANGTHJE 井坂秀治 Hideharu ISAKA
流体力学特論 Advanced Fluid Dynamics	This course teaches the fundamental turbulence, new research progress on fluid mechanics, and advanced technologies of flow measurement and data analysis, and includes the following contents: (1) The fundamental theory of turbulence (basic equations, turbulent transition, statistical theory of turbulence, transport phenomenon of turbulence, turbulent shear layer, turbulent coherence and so on); (2)Vortex dynamics; (3)Measurement technology; (4) Information processing of flow visualization.	李鹿　輝 Akira RINOSHIKA
工業熱力学特論 Advanced Thermodynamics	This course discusses the thermal efficiency of various cycles such as Carnot cycle, Otto cycle, Diesel cycle, Stirling cycle, and so on based on the first law of thermodynamics and the second law of thermodynamics. Furthermore, some new industrial technologies will also be introduced.	赤松正人 Prof. Masato AKAMATSU

Course title	Course description	Instructor
制御工学特論 Advanced Control Engineering	This course provides an overview of the techniques and theory in mechanical control systems. Students will learn the basic idea of state feedback controllers, stability in linear and nonlinear mechanical systems including robotic motion control systems.	水戸部 和久 Kazuhisa MITOBE 多田隈理一郎 Riichiro TADAKUMA
機械運動論 Mechanism and Machine Theory	In the initial stage of machine design, the output of machine is regarded as a motion transmitted between rigid bodies composing the machine. This course lectures primary rigid-body dynamics needed to design a machine, and kinematics of mechanism and structure of robots obtained by connecting multiple links.	南 後　淳 Jun NANGO
強度設計論 Mechanics of Materials for Mechanical Design	This course teaches solid mechanics, fracture mechanics and material science. The aim of this course is to make students able to do mechanical design on non-elastic deformation of mechanical materials under various loads, brittle fracture and fatigue fracture. This course focuses on metal and composites. Strengthening mechanism of these two materials will also be introduced.	近藤康雄 Yasuo KONDO 宮　　瑾 Jin GONG
生体構造力学 Biostructural Mechanics	This course teaches structures, mechanics and functions of cells, tissues, organs and body. Also, utilizing dynamics and micro devices, sensing, estimation and medical application of the functional information of these biological structures will also be lectured.	小沢田　正 Tadashi KOSAWADA

Course title	Course description	Instructor
数値弾塑性力学 Computational Elasto-Plasticity	This course gives a lecture on numerical analysis of deformation of inelastic materials. With recent development of digital computers, it is possible for us to carry out large scale numerical simulations of deformation behaviors of materials with strong nonlinearity. In this lecture, mathematical modeling of such materials behavior, i.e., theory of elasto-plasticity, and its applications to numerical analysis (mostly using finite element method, FEM) are introduced. In particular, formulations of classical plastic flow theories, various yield functions, damage theories and crystal plasticity models are reviewed in detail.	黒田充紀 Mitsutoshi KURODA
材料強度学特論 Advanced Strength and Fracture of Materials	About many engineering materials, learn the relationship between the structure and the mechanical properties (particularly strength and fracture), based on physics and chemistry. Understand important concepts when considering manufacturing processes and applications in real environments. Learn the engineering thinking necessary to use for robots and medical equipment, etc.	古川英光 Hidemitsu FURUKAWA
材料システム学特論 Advanced Materials System	This course teaches mechanical and physical properties of engineering materials from a thermodynamic viewpoint. A multi-scale way of understanding the material properties is explained based on crystal structure, microscopic defects like dislocation and grain boundary, and microstructure. Recent topics on computational procedures for material design are also introduced.	上原拓也 Takuya UEHARA
伝熱工学特論 Advanced Heat Transfer	This course discusses the heat transfer characteristics of natural and forced convections of different fluids such as an electro conducting fluid, a paramagnetic fluid, a diamagnetic fluid, and nanofluid in the laminar flow region. Furthermore, some state of the art heat transfer researches will also be introduced.	赤松正人 Masato AKAMATSU
エネルギー環境工学特論 Environments on Energy	Environments on energy deals with our major environmental problems. With respect to energy, we have tried to cover the basic concepts, resources, applications and problems of current interest.	鹿野一郎 Ichiro KANO

Course title	Course description	Instructor
計算流体力学特論 Advanced Computational Fluid Dynamics	This course introduces students to finite difference methods of computing incompressible fluid flows. This course covers the following contents. Modeling of incompressible flows and derivation of governing equations; Fundamentals of partial differential equations: classification, initial and boundary conditions, diffusion equation, Poisson equation and advection equation; Finite difference methods: central and upwind methods, numerical convergence, stability analysis, explicit and implicit methods, iterative methods. Projection methods for incompressible flows; Programming, data visualization and interpreting techniques; Curvilinear grid based programming.	中 西 為 雄 Tameo NAKANISHI
燃焼工学 Combustion	This course teaches the fundamentals of combustion based on thermodynamics. The contents include theoretical combustion temperature, chemical equilibrium, chemical kinetics, and so on.	奥 山 正 明 Masaaki OKUYAMA
流体機械特論 Advanced Fluid Machinery	This course deals with gas turbine in various fluid machineries, which consists of compressor, combustor, and turbine mainly. Today, it is often used for power generation and aircraft propulsion. Its principles, components, performances, applications, and recent trends are lectured.	篠 田 昌 久 Masahisa SHINODA
混相流特論 Advanced Multiphase Flows	Multiphase flow is simultaneous flow which composed of different phase materials (gas or liquid or solid), or different materials with insoluble chemical properties (i.e. oil and water). In this lecture, we introduce the basis theory about the multiphase flow (mainly gas-liquid two phase flow).	幕 田 寿 典 Toshinori MAKUTA
機械設計論 Principles of Mechanical Design	This course teaches the overall knowledge of mechanical design, and the basis of materials strength and materials science to perform the smart mechanical design. Then, the course lectures the logical way to select the optimal material under a given mechanical condition.	飯 塚 博 Kazuhiro IIZUKA

Course title	Course description	Instructor
ロボティクス特論 Advanced Robotics	The course teaches basic theories for control of a robot manipulator. Topics include Kinematics, Singularity Consistent Approach, Quintic Interpolation, Path Panning, Multibody Dynamics. Students will learn these topics with a graphical robot simulator.	妻 木 勇 一 Yuichi TSUMAKI
システム工学特論 Advanced Systems Engineering	This course teaches the outline of systems engineering and the foundation of linear dynamical systems theory. At the outline of systems engineering, the analysis, plan, optimization and design of systems are treated. At the foundation of dynamical systems theory, the modeling, analysis, controllability, observability and stability of continuous and discreet systems are explained with exercises.	秋 山 孝 夫 Takao AKIYAMA
ＣＡＤ／ＣＡＭ特論 Advanced CAD／CAM	Main theme is intelligent CAD/CAM system. This course teaches computer aided mechanical design, 2D and 3D modeling, geometry processing, knowledge representation and expert system.	大 町 竜 哉 Tatsuya OHMACHI
計測制御特論 Advanced Instrument and Control System	This lecture focuses on working principles of microdevices for developments of advanced instruments and control systems. Various types of sensors, actuators, and application systems based on MEMS such as electronic and optical micrdevices are, particularly, emphasized for robots, automobiles, and medical systems.	峯 田 　 貴 Takashi MINETA 西 山 宏 昭 Hiroaki NISHIYAMA