

## **Subject Descriptions**

### ***Departmental Curriculum***

Master's Thesis in Engineering I - IV  
Special Seminars in Engineering I - IV  
Ethical and Social Implications of Engineering

### **Solid Mechanics and Materials Engineering**

#### **Thermal and Fluid Engineering**

#### **Intelligent Machine Systems**

### ***Design, Analysis and Processing of Engineering Materials***

Advanced Theory of Plasticity (Sueyoshi, T.)

Studies on continuum mechanics and plastic constitutive theory, Analysis of plastic large deformation of metals.

Corrosion and Protection (Oshikawa, W.)

Corrosion, Corrosion Protection.

Theory of Elasticity (Miyazaki, T.)

Study on stress analysis of two-dimensional problems and linear fracture mechanics.

Advanced Material Processing (Shibata, S.)

Composites materials consisting of polymer, fibers and particles.

Solid Mechanics (Fujikawa, M.)

Study of the continuum mechanics at the large deformation and its use in the Finite Element Method.

Advanced Partial Differential Equation I (Kondou, R.)

Advanced Partial Differential Equation

Advanced Partial Differential Equation II (Kondou, R.)

Advanced Partial Differential Equation

### ***Thermal and Fluid Engineering***

Advanced Fluid Mechanics I (Yaga, M.)

Study of numerical calculations of compressible flow by solving shock tube problems changing the initial and boundary conditions.

Advanced Fluid Mechanics II (Ishikawa, M.)

Wing theory, aerodynamic tools of two and three dimensional incompressible flow.

Advanced Measurements of Turbulent Flow (Teruya, I.)  
Measurements of turbulent flow by using sensors, Data acquisition.

Advanced Fluid Machinery (Ameku, K.)  
Airfoil performances, design for wind energy conversion systems.

Advanced Heat Transfer Engineering I (Senaha, I.)  
Study of heat and mass transfer on the heat conduction, the heat convection and the thermal radiation.

Advanced Heat Transfer Engineering II (Matsuda, S.)  
Study of heat transfer and its application, modeling of heat and mass transfer phenomena.

Advanced Transport Phenomena (Minakuchi, H.)  
Fundamentals of momentum, heat and mass transfer.

Advanced Partial Differential Equation I (Kondou, R.)  
Advanced Partial Differential Equation

Advanced Partial Differential Equation II (Kondou, R.)  
Advanced Partial Differential Equation

### ***Mechanics and Control Engineering***

Advanced Signal Processing in Mechanical Engineering (Oshiro, N.)  
Digital signal processing, Fast Fourier Transform, Wavelet, Image processing and feature extraction

Soft Control Engineering (Kinjo, H.)  
An intensive study of the intelligent control systems: fuzzy control system, neuro-control system, genetic algorithms, stochastic control system.

Advanced Control System Theory (Uezato, E.)  
PID control, Regulator, Observer, Fuzzy control, GA., Intelligent control.

Intelligent Control Engineering (Nakazono, K.)  
Genetic Algorithms, Neural Network, Design for Nonlinear Systems.

Advanced Partial Differential Equation I (Kondou, R.)  
Advanced Partial Differential Equation

Advanced Partial Differential Equation II (Kondou, R.)  
Advanced Partial Differential Equation

## **Electrical Energy and Systems Control Engineering**

Advanced Magnetic Materials (Yamamoto, K.)

Ferromagnetic Materials, Magnetostriction, Magnetic Anisotropy.

Advanced Electric Machinery (Urasaki, N.)

DC motors, AC motors, Variable frequency drives, Switching converters, Power conversion.

Advanced Power Energy Conversion (Yona, A.)

Power energy conversion, Renewable energy, Optimal operation.

Advanced Power Electronics (Senjyu, T.)

DC/DC converter, PWM inverter, Motor control, AC/DC converter, Energy conversion, FACTS devices in Power System, Advanced Control.

Advanced Power System Analysis (Harada, S.)

Computational Methods for Power System Load Flow, Optimal Power Flow and Stability Analysis.

Advanced Plasma Engineering (Yonesu, A.)

Characteristics of plasma, Plasma processing.

Advanced Nonlinear Control Theory (Hanba, S.)

Geometric properties of nonlinear control systems, stability, nonlinear control system Design.

Advanced Medical Electronics (Higa, H.)

Medical Instrumentation, Therapeutic and prosthetic devices.

Advanced Modern Control Theory (Nagado, T.)

State equations, Stability, Controllability and Observability.

Advanced Relativistic Electromagnetism (Shimoji, N.)

Electrodynamics, Maxwell's equations, Special relativity, Tensor analysis.

## **Electronic Systems and Devices**

Organic Electronics Material Engineering (Kageyama, H.)

Organic Functional Materials, Organic Electronics Devices.

Advanced Thin Film Materials Engineering (Higa, A.)

Thin film materials, preparation methods of thin films, characterization methods of thin films and surfaces.

VLSI System Design (Shimabukuro, K.)

VLSI architecture, VLSI layout, Circuit simulation, VLSI CAD tools.

Advanced Quantum Computer Engineering (Kinjo, M.)

Quantum Algorithms, Quantum Gates, Quantum Devices.

Advanced Semiconductor Electronics (Yamazato, M.)

p-n junction, MOS device, Sensor device.

Advanced Vacuum Technology (Okada, T.)

Vacuum pumps and gauges, Phenomena in vacuum, Fabrication processes for semiconductor.

Advanced Dependable Systems (Nagata, Y.)

Dependable computer systems, Fault-tolerant systems and error detecting/correcting Code

Advanced Signal Processing Systems (Fujii, S.)

Digital signal processing, High-resolution spectral analysis in signal processing, Neural network application for signal processing.

Advanced Wireless Communication Systems (Saito, M.)

Mobile Radio, Propagation, Multiple Access, Modulation Techniques.

Advanced Image Processing (Nozaki, S.)

Image processing systems and its applications based on image analysis or inverse problems.

Advanced Reconfigurable Architecture (Osana, Y.)

Fundamental of reconfigurable device architecture, and its design method.

Optical Device Instrumentation Technology (Miyagi, K.)

Passive and Active fiber components using the ultra long optical transmission system based on light-wave phenomenon, "Maxwell's equations, transmission characteristics on optical fibers and fiber design".

Telecommunication and Speech Signal Processing (Funaki, K.)

Speech coding, linear prediction, signal processing, telecommunication.

## **Civil Engineering**

### **Architecture & Building Engineering**

#### ***Environmental Planning and Design Engineering***

Advanced Architectural Design (Irie, T.)  
Design, Planning, and Program.

Advanced Urban Planning (Ono, H)  
Landscape and urban planning system, Land use planning.

Advanced Community Space Planning (Shimizu, H.)  
District planning, Neighborhood, Community.

Advanced Environmental Noise (Tokashiki, T.)  
The analysis and the results of the research on environmental noise.

Advanced Regional Planning and Design (Ando, T.)  
Sustainable Development, Appropriate and affordable technology.

#### ***Structural and Mechanical Engineering of Bridges and Buildings***

Advanced Building Materials (Yamada, Y.)  
Durability of concrete, Salt attack, Alkali aggregate reaction, Fresh concrete.

Advanced Structural Mechanics (Nakada, K.)  
Plasticity, Redistribution of stress, Collapse mechanism, Full plastic moment.

Advanced Design Engineering of Steel Structures (Shimozato, T.)  
Steel structure, Structural design. Bridge design

Advanced Computational Solid Mechanics (Tomiya, J.)  
Numerical simulation method, Computational engineering and science.

Advanced Materials Science of Concrete (Suda, Y)  
Cement hydration, Microstructure of concrete, Deterioration mechanism.

Advanced Diagnosis Engineering of Steel Structures (Tai, M.)  
Fatigue, Corrosion, Maintenance of steel structures.

#### ***Environmental Disaster Prevention Engineering***

Advanced Continuum Mechanics (Nakaza, E.)  
Hooke's law, constitutive equations of a solid and a fluid, properties of modulus, properties of failure of a solid material, new theory of continuum mechanics. Numerical simulations.

Advanced Structural Design in Natural Hazard Prone Areas (Castro, J.J.)  
Natural hazards (wind, earthquakes & ocean waves) and their interaction with building structures. Design provisions for structures to resist horizontal loads.

Advanced River Engineering (Fukuda, T)

Numerical simulation of flood flows and river-bed variation, depth integration of equations of fluid flows, and curvilinear coordinate system.

Advanced Geotechnical and Geoenvironmental Engineering (Matsubara, H)

Theory of unsaturated soil mechanics (Equation of continuity, Richards' equation, etc.), numerical simulation method in geomechanics, rock weathering, mathematical modelling of geomaterials, some issues in geotechnical and geoenvironmental engineering.

Advanced Rock Mechanics (Ito, T)

Fundamental laws of continuum mechanics and basis of rock mechanics and engineering. Characteristics of discontinuous rock, slope stability and underground cavity.

Advanced Numerical Methods for Fluid Dynamics (Iribe, T.)

To learn the basics of fluid mechanics, computational fluid dynamics, programming techniques, simulation method and large-scale simulation.

## **Computer Science and Intelligent Systems**

Advanced Algorithms (Nakamura, M.)

Graph Algorithms, Optimization Algorithms, and Related Applications

Advanced Software Engineering (Kono, S.)

Software System Development, Large program, Object Oriented Systems, Persistent Object, Verification, Test.

Advanced Parallel Processing (Nakamura, M.)

Parallel Programming, Parallel Algorithms, Distributed Algorithms, and Distributed systems.

Advanced Wireless Systems (Wada, T.)

Wireless Communication Related Signal Processing Basics, One of the State-of-the-art Communication System such as OFDM, Mobile Phone such as 4G LTE and 5G, 5G New Radio System, Digital Signal Processing Simulation Tools such as Matlab.

Advanced Multimedia Information Processing (Nagayama, I.)

Digital Signal Processing, Intelligent Image Processing, Physiology and Cognitive Science for Human Perception. Neural Computing and Algorithms for Communication Systems.

Advanced Probabilistic Models (Okazaki, T.)

Mathematical Statistics, Computational Statistics, Data Science, and Human Behavior Modeling.

Advanced Service Engineering (Okazaki, T.)

Service Engineering, Data Science, and Human Behavior Analysis.

Advanced Data Mining (Naruaki, T.)

Web inspired Research involving Search, Models of Search, Retrieval and Data Mining, Algorithm Design and Analysis.

Advanced UI/UX (Akamine, Y.)

Human Computer Interaction, Usability Engineering, Interaction Design and User-Centered Design.

Advanced Intelligent Robotics (Yamada, K.)

Intelligence of Autonomous Robots, Learning Methods and Emergence of Robot behaviors. Behavior based AI Systems.

Advanced Human Augmentation Engineering (Yamada, K.)

Studying Technologies and Elemental Technologies to extend and support Human Perception, Cognitive Abilities, and Physical Abilities from Engineering Perspective.

Advanced Intelligent Information Processing (Kang, D.)

Design and Development of Intelligent Systems, Machine Learning, Signal Processing, Knowledge Representation.

Advanced Artificial Intelligence (Endo, S.)

Problem Solving, Knowledge Representation, Machine Learning, Evolutionary Computation and Intelligent Agents.

Advanced Artificial Society & Multi-agent Systems (Endo, S.)

Multiagent Systems, Artificial Societies, Simulated Organizations and Interaction of Humans & Computational Agents.

Advanced Biological Information Processing (Kunita, I.)

Techniques for Biosignal Measurements, Analysis of Biological Time-Series Data, Nonlinear Time-Series Analysis.

Project Management Practice (Nakamura, M.)

Project Management Body of Knowledge, Exercise on IT-related projects.