国立大学法人
長岡技術科学大学
Nagaoka University of Technology

OUTLINE OF DOCTORAL PROGRAM

IN THE GRADUATE SCHOOL OF ENGINEERING

2022

Contents

※ About the staff will be retired within three years

Note: In the "Name" column, * indicates the staff who will be retired on March 31, 2022.

Note: In the "Name" column, ** indicates the staff who will be retired on March 31, 2023.

Note: In the "Name" column, *** indicates the staff who will be retired on March 31, 2024.

Outline of Doctoral Program in the Graduate School of Engineering, Nagaoka University of Technology

Ⅰ The Objective of the Doctoral Program

The aim of the Doctoral Program in the Graduate School of Engineering is to develop high-level research ability and prolific knowledge, which are indispensable for conducting self-reliant research in a specific field of study.

Ⅱ Educational and Research Courses and Fields

Under the university's basic policy an integrated curriculum is provided as a unified course of study that begins in the undergraduate years and continues systematically through graduate studies. Furthermore, management of research activities is carried out under integrated chairs, which makes possible broad, interdisciplinary research that is responsive to the changing needs of society.

The Doctoral Program, on the other hand, has been organized by scrapping the undergraduate-to-master's programs and rebuilding them into a revolutionary system of education and research to allow even more advancement of an interdisciplinary nature and epoch-leading role. Accordingly, the Doctoral Program consists of four courses, i.e., Information Science and Control Engineering, Materials Science, Energy and Environment Science, and Integrated Bioscience and Technology. These four courses are composed of many educational and research fields each of which, in turn, is organized by assembling several integrated chairs belonging to different disciplinary areas.

This system provides academic achievement in each field of study, vigorous development of new fields, advancement of the study itself and the training of high level researchers.

Details of the courses and the three fields in each are given below.

1. Information Science and Control Engineering

The focus of research in technology has shifted from concentrating on highly specialized areas of study to a multi-disciplinary approach. Space development, ocean development, and robotics are such examples.

This course adapts such an interdisciplinary approach. It includes the fields of knowledge/information engineering, information technology, and control engineering. The aims of the course are:

(i) to improve computation, image processing, and radio and light wave technologies;

(ii) to improve super-precision measurement and control technology and super precision processing technology; and

(iii) to develop machine mechanisms and production system control technology through the integration of these technologies.

(1) Knowledge and Information Engineering

Knowledge engineering concerns the development of human abilities such as learning, skill, sense, and cognition. One of the achievements has been robotics. Sensing and cognition are yet to be developed. This field deals with technologies for processing pattern information and related intelligent information. It also attempts to improve mechanisms carrying a complex array of various elements including some aspects of industrial and management systems science.

(2) Information Technology

The development of high-speed transmission and processing technologies utilizing radio/optical wave engineering and high performance computers has contributed to the development of modern society and has become indispensable to every aspect of technology. This field aims to utilize this high-tech research to develop integrated technologies such as combining image processing, sound/speech processing, and electric waves and to contribute to these fast growing areas in the application of information technology.

(3) Precision/Control Engineering

This field is concerned with precision engineering, production engineering, and advanced control engineering using computer technology.

Recent research activities have focused on the following:

(i) dynamics and noise of machine elements, super-precision mechanisms and mechatronics devices;
(ii) super-precision material processing using laser beams, ion beams and electron beams, and solidification theory;
(iii) super-precision machining and grinding;
(iv) dynamic machine design theory and CAD/CAM systems;
(v) advanced control theory and its application to precision machines and industrial robots;
(vi) nanometer measurement technology;
(vii) texture measurement technology and its application to glacier dynamics.

This course also provides a program on “Safety Engineering”. This program aims to take a leading role in the development in safety certification, risk evaluation, development of safety technology based on global safety standards, safety design, risk management, safety management, and safety culture of organization

University Staff and Fields of Research

(1) Field of Study: Knowledge and Information Engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
ITO, Yoshihiro	Business Management	1) Strategic management 2) Business model 3) Marketing

NOMURA, Shusaku	Ambient Biomedical Engineering Ambient Feedback Systems KANSEI Physiology Bio-signal processing	1) Development of Ambient Feedback Systems, which is an adaptive ambient control system based on human physiological information aiming at controlling humane mental and/or somatic state 2) Psychological stress evaluation with human hormonal secretion, and development of an apparatus to determine stress-related hormones with a non-invasive manner.
HARA, Shin-ichiro	Geometry / Topology	1) Algebraic Topology 2) Lie Groups
YUKAWA, Takashi	Intelligent Informatics	1) Knowledge Processing 2) Information Retrieval 3) Text Processing 4) e-Learning 5) Parallel Computing
WATAHIKI, Nobumichi	Business administration Sociology	1) Industry-Academia collaboration 2) Industrial Cluster 3) Startup management

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
SUZUKI, Nobutaka	Business administration	1) Strategic Management 2) Technology Management 3) Manufacturing Management
ZHANG, Kun	Knowledge and Information Engineering	1) Safety data management 2) Injury information description framework 3) Market surveillance system for products 4) Products accident ontology 5) Utilization of safety big data
NONAKA, Hirofumi	Intelligent Information	1) Datamining 2) Textmining 3) Spatial statistics 4) Patent mining 5) Legal document mining
HAYAMA, Tessai	Media Informatics	1) Computer-supported Collaborative work 2) Knowledge creation support 3) Educational technologies 4) Data mining and its applications
YAMAMOTO, Kenichiro	Ergodic Theory Dynamical System	1) Large deviation principle 2) Equilibrium states
NAKAHIRA, Katsuko, T.	Perceptual Informatics	1) Service Informatics 2) Perceptual Informatics 3) Learning Support
OHASHI, Satoshi	Welfare Engineering and Assistive Technology	1) Biological signal processing 2) Sensing data analysis 3) Location information analysis 4) Image processing
SHIRAKAWA, Tomohiro	Intelligent Informatics, Life/Health/Medical Informatics, Biophysics	1) Artificial Intelligence 2) Machine Learning 3) Data Science, Bio-computing
NISHIYAMA, Yuta	Theory of Life Internal Measurement Animal Behavior Embodied Cognition Complex Systems Performance Art	1) Swarm: Understand a wholeness of natural collective behavior and develop brand new swarm-inspired systems. 2) Bodily Self-Consciousness: Investigate indefiniteness of self-body and change it. 3) Performance Art: Express your life.

(2) Field of Study: Information Technology

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
IWAHASHI, Masahiro	Communication Network engineering	1) Signal processing 2) Multimedia 3) Information theory 4) Digital circuits and systems
ONO, Hiroshi	Applied optics Quantum optical Engineering	1) Polarization holography (Three-dimensional vector hologram) 2) Highly-functionalized grating devices 3) Liquid crystals for photonics 4) Highly-functionalized optical films for polarization control
TANAKA, Kunihiko	Optical properties of semiconductors and applications	1) Solar cell 2) Growth of semiconductor thin films 3) Spectroscopy of semiconductors
NAKAGAWA, Kenji *	Communication Network engineering	1) Queuing Theory 2) Network Performance Analysis 3) Fast Simulation
NAGASAWA, Shigeru *	Production engineering Processing studies Mechanics of materials	1) Material processing 2) Cutting and bending process 3) Application of Finite element Analysis for solid mechanics 4) Forming technology of composite materials (paperboard, metal sheet and resin film) 5) Safety diagnosis and energy saving technology of tool wear and cutting condition using AE signals

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
UNUMA, Takeya	Quantum semiconductor electronics	1) Nanostructured semiconductors for optoelectronics 2) Organic semiconductors for flexible electronics 3) Terahertz spectroscopy with a femtosecond laser
YENDO, Tomohiro	Human interface Media informatics	1) 3D image display, AR display 2) Camera application system for human interface 3) Visible light communication
OTSUKA, Yuichi	Material Mechanics of materials	1) Strength and Fatigue of Engineering Materials 2) Reliability of Strength of Materials 3) Failure Analysis 4) Biomaterials 5) Strength in Corrosive Environment 6) Safety Design
KATO, Ariyuki	Optical properties of condensed matter and applications	Crystal growth of functional optoelectronic materials and its applications for optoelectronic devices
SASAKI, Tomoyuki	Applied Optics Terahertz Engineering	1) Liquid Crystal 2) Control of Terahertz Waves 3) Vector holography
SUGITA, Yasunori	Communication Network engineering	1) Filter Design and Analysis 2) Image Processing 3) Acoustic Signal Processing
TAMAYAMA, Yasuhiro	Electromagnetic optics Nonlinear optics	1) Design and analysis of metamaterials 2) Controlling electromagnetic waves 3) Enhancement of local electromagnetic fields

WATABE, Kohei	Communication Networks	1) Accurate Measurement 2) Network Modeling 3) Network Simulation 4) Internet of Things
MANADA, Akiko	Fundamentals for Computer Science	1) Characteristics on data sequences 2) Coding for data storage media 3) Analysis on network topologies 4) Graph theory and its applications

(3) Field of Study: Precision/Control Engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
AKETAGAWA, Masato	Information and control engineering (for Mechanical systems)	1) Precision Engineering 2) Applied Optics 3) Nanometer measurement and control 4) Scanning Probe Microscope 5) Nanotechnology
ABE, Masajiro	Dynamics Design engineering System Safety	1) Machine Dynamics 2) Safety Design Engineering 3) Dynamics of Machinery-Environment System 4) Construction Machinery Engineering 5) Materials Handling Machinery Engineering
ISOBE, Hiromi	Production engineering Mechanism Machining	1) Vibration Aided Machining 2) Non-contact Handling for Board
OHTA, Hiroyuki	Design engineering Machine functional elements Tribology	1) Sound and vibration of rolling bearings 2) Dynamics of linear ball bearings 3) Transmission errors of trochoidal gears
KADOWAKI, Satoshi ***	Thermal engineering Safety engineering	1) Combustion 2) System Safety 3) Fire & Explosion 4) Risk Assessment
KAMIMURA, Seiji	Energy engineering Natural disaster science Thermal engineering	1) Freezing process by radiation cooling 2) Snow storage for space cooling 3) Damage anticipation of earthquake and snow-hazards coupling 4) Thermal design of road snow-melting system
TAKEDA, Masatoshi	Functional materials	1) Energy conversion materials 2) Energy conversion, system 3) Electronic properties of Boron-rich semiconductors
TANABE, Ikuo *	Production engineering Processing studies	1) Production management 2) Machine tools 3) Cutting 4) Ultra-precision machining 5) Production management 6) Micro-fabrication
FUKUDA, Takabumi *	System Safety	1) Safety Engineering of Machinery 2) Risk Assessment 3) Operational Reliability of Safety Related Parts of Control Systems
MIYOSHI, Takanori	Safety engineering Control engineering Robot engineering	Machinery safety engineering, Tele-control, System safety, Man-machine interface, Risk assessment, Power-assistive control, vibration control

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
KIMURA, Tetsuya	System Safety	1) Service robots safety 2) Standardization and utilization of disaster response robots 3) Risk assessment of a mobile robot
KOBAYASHI, Yasuhide	Control engineering Dynamics Control	1) Robust active noise control of ducts 2) Disturbance attenuation control on water surface 3) Robust speed control of rotary systems

SPECIALLY APPOINTED ASSOCIATE PROFESSOR FOR ACADEMIA-INDUSTRY FUSION

NAME	RESEARCH FIELD	RESEARCH TOPICS
SHOJI, Kan	NanoBio Engineering Microfluidics Scanning Probe Microscopy (SPM) Biohybrid Robotics	1) Nanopore sensing with biological and DNA nanopores 2) Development of microchannel-based nanopore sensing platforms 3) Development of biological-inspired SPM 4) Insect biofuel cell driven micro wireless sensors

2. Materials Science

For promoting original and creative technologies, one key is to develop new materials which can bring forth innovations in technology. Requirements for materials nowadays have become wide and complicated, and the number of materials has become very large with the development of composite materials. In order to cover the requirements for materials, the materials science course provides the following three fields.

(1) Structural Materials Engineering

Since the area of human activity has expanded to the polar and deep sea, or even to outer space, the requirements for structures and facilities have become highly elaborate and complicated. The materials which compose the structures and facilities are being used even in severe circumstances. In this field, mechanical properties of a number of materials are to be grasped systematically in view of macro-, micro- and nano-level analyses. Eventually, structural materials which process high specific strength properties are to be developed.

(2) Functional Materials Engineering

As technology improves, materials with new highly performative functions need to be created. The functions of materials are determined by factors such as the kind of atoms, molecular structure, crystal structure, and electronic structure of its constituents. Recently the field of functional materials engineering has rapidly developed: e.g., 1) the development of (i) electronic devices such as a super fast semiconductive element, which was realized by virtue of new functional and artificial crystals, and (ii) light emitting devices with new functions; 2) high temperature oxide superconductors, and 3) realization of highly functional

organic materials. This field concentrates on the following: (i) control of electronic and crystal structure based on condensed matters; (ii) organic materials with value-added function and useful high-polymer materials; (iii) performance evaluation; and (iv) creation and development of new functional materials and new function elements.

(3) Reliability Engineering of Materials

Materials are affected by various damaging factors such as various types of stress, heat, cold, corrosion, and strong radio activity. To design parts to be usable under such conditions, it is necessary to estimate and optimize how long materials function.

This field aims 1) to have students learn the following methods: (i) the method to evaluate the quality of material through NDT; (ii) the method of estimating how long a material functions, using degradation; and (iii) the basics of the method of optimization, which is one of the main mathematical methods in system engineering, and 2) to research and develop the application of basic research to planning, analysis, design and control.

University Staff and Fields of Research

(1) Field of Study: Structural Materials Engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
SAITOH, Hidetoshi	Thin film process Sensor materials Optical functional materials Carbon material	1) Ceramic nanoarchitecture 2) Material design for CVD-film 3) Material design for carbon film
SHIMOMURA, Takumi	Civil engineering materials Construction Construction management Structural engineering Earthquake engineering Maintenance management engineering	1) Properties of Concrete 2) Durability of Concrete Structures
TAKAHASHI, Osamu	Civil engineering materials Construction Construction management	1) Mix Design of Hot Mix Asphalt Mixtures 2) Mechanical Characterization of Asphalt Concrete
TAKENAKA, Katsuhiko	Polymer chemistry Polymer Textile materials	1) Synthesis and polymerization of 1,3-dienes containing functional groups 2) Synthesis of organic - inorganic hybrid polydiene-based materials
NANKO, Makoto	Structure Functional materials Material processing/treatments	1) Thermodynamics and Diffusion of Metals and Oxides 2) High Temperature Oxidation/Corrosion 3) Hybrid Materials 4) Materials Processing

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
UCHIDA, Nozomu ***	Computational Chemistry Thermochemistry	Computational study on the characteristics of natural rubber, Computational study on the mechanism of CO2 reduction with Pt catalyst, Computational study on the H2 storage characteristics of graphite.
TANAKA, Satoshi	Science of inorganic materials	1) Powder Processing of Ceramics 2) Design of Particle Packing of Powder Compact 3) Development of Novel Forming Method of Ceramics 4) Microstructure and Mechanical Property of Ceramics 5) Microstructure and Functional Property of Ceramics
HOMMA, Tomoyuki	Nanostructural analysis Light metals Phase transformation Strength of materials Diffraction physics Creep of materials	1) Development of high strength Ti alloys 2) Age-hardening behavior in light metals 3) Microstructural characterization of Ni base superalloy
MIYASHITA, Takeshi	Maintenance management Structural engineering	1) Structural health monitoring 2) Steel structural engineering

SPECIALLY APPOINTED ASSOCIATE PROFESSOR FOR ACADEMIA-INDUSTRY FUSION

NAME	RESEARCH FIELD	RESEARCH TOPICS
NAKATA, Taiki	Structural materials Material processing	1) Development of wrought magnesium alloys 2) Tailoring microstructure and texture of magnesium alloys 3) Electron backscattered diffraction 4) Electron microscopy 5) Extrusion

(2) Field of Study: Functional Materials Engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
KAWAI, Akira ***	Microdevices Nanodevices	1) Nano-Micro System 2) Device process 3) Nanoscale measurement and control
KAWAHARA, Seiichi	Polymer Rubber Materials	1) Materials Chemistry 2) Rubber Materials 3) Organic Materials Engineering
KITATANI, Hidetsugu ***	Statistical Mechanics Condensed Matter Physics	1) Phase Transition of Spin Systems 2) Statistical Physics of Spin Glasses
KIMURA, Munehiro	Electronic device Electronic equipment	1) Liquid Crystal Display Device 2) Physics of interfacial surface 3) Measurement method of surface anchoring energy of LCD 4) Ellipsometry
NAKAYAMA, Tadachika	Nanostructural science Applied materials science Energy Harvesting 3D Nano Fabrication	1) The Anisotropic Nano Ceramics, Nano Material Processing for Catalysts and Electric Devices 2) Materials Science for Energy Harvesting, Solar Cell, and other energy related materials 3) NanoBio Materials by Nanoimprint processing and Novel Plasma technology with Nanosec Pulsed Electric Power Supply

MAEKAWA, Hirofumi	Synthetic chemistry Organic chemistry	1) Synthetic Organic Chemistry 2) Organic Electron Transfer Chemistry 3) Organic Electrochemistry
MATSUBARA, Hiroshi	Applied electrochemistry	1) Electroless and electroplating 2) Nano-composite plating 3) Initial deposition process of electroless plating

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
ITO, Haruhiko ***	Physical chemistry Plasma chemistry Molecular spectroscopy	1) Studies on the electronic structure of the diatomic free radicals 2) Analysis of the plasma processes to synthesize amorphous carbon and related materials 3) Fabrication of super-hard carbon-related films in amorphous phase
OKAMOTO, Tomoichiro	Functional materials Devices	1) Electroceramics 2) Nano-carbons 3) Electronic devices 4) Optical devices 5) Sensors
TAKAHASHI, Yukiko	Dye nanoparticles Functional thin films Sensors	1) Dye nanoparticle coated test strips for ultra trace harmful ions 2) Photosensitizer dye nanoparticle coated membrane for generation of reactive oxygen species 3) Development of a massive and versatile production of organic dye nanoparticles
MIZOSHIRI, Mizue	Optical material processing, laser microprocessing, micro/nano processing, microdevice, sensor	1) 3D microfabrication by ultrafast laser processing 2) Thin-film thermoelectric generators by microfabrication process 3) Imaging of magnetic domains using optical devices
FUNATSU, Asami	Surface chemistry Interface chemistry	1) Nanosheet 2) Surface analysis 3) Inorganic material chemistry

SPECIALLY APPOINTED ASSOCIATE PROFESSOR FOR ACADEMIA-INDUSTRY FUSION

NAME	RESEARCH FIELD	RESEARCH TOPICS
YAMASHITA, Tomoki	Condensed Matter Physics Materials informatics	1) Crystal structure prediction 2) Band calculation 3) Rechargeable battery

(3) Field of Study: Reliability Engineering of Materials

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
IHARA, Ikuo	Materials Evaluations Nondestructive Sensing Mechanics of materials Measurement Engineering	1) Nondestructive Materials Evaluation 2) Ultrasonic Sensing 3) Industrial Processes Monitoring 4) Thin films and Coatings Characterizations 5) Nano-indentation Testing

IWASAKI, Eiji	Structural engineering Earthquake engineering Maintenance management engineering	1) Development of numerical methods of structural analysis 2) Optimal design and performance of shell structures and bridges 3) Design method of cable-stayed bridges 4) Performance of steel structures for corrosion by airborne salts
MIYASHITA, Yukio	Materials Mechanics of materials	1) Strength and fatigue of advanced materials 2) Joining process and strength of dissimilar materials joint 3) Fatigue of magnesium alloy 4) Joining of magnesium alloys 5) Laser welding of dissimilar materials, Laser cutting of brittle materials 6) Joining and material modification by using friction stir process

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
KURAHASHI, Takahiko	Computational Mechanics	1) Numerical determination of optimal shape 2) State estimation based on filtering theory 3) Identification of material properties

3. Energy and Environment Science

Human beings have established a highly-developed civilization through the progress of technology. In order to maintain this prosperous situation, we need to solve existing problems of population, cities, resources, and the environment to keep the balance between nature and our human society. There are two measures to do this: one is to develop new energy sources and advanced energy-related devices and systems, and the other to evolve methods for saving energy resources. The Energy and Environment Science course covers the following three fields, which all aim to keep the balance between nature and our human society.

(1) Energy Systems Engineering

The exhaustion of fossil fuel is of an urgent issue. In order to solve this, we need not only to improve efficiency in the utilization of existing fuels, but also to develop new energy sources such as renewable energy. Addressed in this area are many problems that cannot be solved only by a method in any particular, established research field.

This field aims (i) to improve the performance of equipment through studies on particular energy technologies and methods (transportation, storage, and transformation) and on various energy types including heat, nuclear, electrical, and mechanical energies; (ii) to integrate related technologies in different research fields of environment, materials, control, etc.; and (iii) to systematize technologies and methods to build up a sustainable energy system, in which the concept of the system safety engineering is introduced to secure the safety, especially in the proper usage of nuclear energy.

(2) Energy Materials Engineering

New material is required in the development in energy technology that contributes toward effective utilization and saving of energy sources and improvement in processes of

transportation, storage, and transformation of energy. Newly developed materials can be applied to energy-related devices.

Aims of this field contain: (i) effective utilization of nuclear resources; (ii) chemical transformation of solar energy by photosynthesis; (iii) optimization of energy transmission; and (iv) development of functional materials for higher efficiency and saving of energy.

(3) Environment Systems Engineering

Population growth in urban areas and urban development in Japan have promoted high economic growth. On the other hand, many problems have also arisen, such as a degraded environment, defects in disaster prevention, and lack of proper conservation and use of the land. Today, a comprehensive land planning of our nation including relocation of cities and important facilities like factories is needed for the appropriate use, control, and modification of nature. The destruction of the natural and the social environments should be minimized, and within this criterion, the natural environment may be reformed to fit human society.

This field aims (i) to investigate social systems suitable to the natural environment in terms of both nature and society; (ii) to clarify the nature of natural disasters; (iii) to determine desirable countermeasures against disasters; and (iv) to identify appropriate social facilities.

University Staff and Fields of Research

(1) Field of Study: Energy Systems Engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
ITOH, Junichi	Power electronics Power conversion Motor drive system	1) Development of simple, high efficiency and high performance power converter 2) Development of AC/AC direct power converter 3) High performance and simple Motor control
OHISHI, Kiyoshi **	Motion Control/ Power Electronics/ Robotics	1) Motion Control of Robotics and Mechanical System 2) High Performance Inverter Control for AC Servo Motor 3) Real World Haptics 4) Vibration Suppression Control of Motor and Gear System
JIANG, Weihua	Power engineering Electron device Plasma science	1) Compact pulsed power generator 2) High power microwave generation 3) High energy-density science 4) Plasma Applications
SUEMATSU, Hisayuki	Inorganic materials Physical properties	1) Development of material preparation methods utilizing extreme conditions 2) Synthesis of novel superconductive, magnetic and other novel materials
SUZUKI, Tatsuya	Nuclear Chemistry Radiochemistry	1) Nuclide Separation & Partitioning 2) Isotope Effect / Isotope Separation 3) Plasma Chemistry 4) Nuclear Reprocessing Engineering 5) Nuclear Fuel Cycle Engineering

MIURA, Yushi	Power Engineering Power System Engineering Power Electronics	1) Distributed Generations 2) Smart Grid 3) Microgrid 4) Applications of Power Electronics in Power System
MIYAZAKI, Toshimasa	Dynamics Control	1) Motion Control 2) Mechatronics 3) Robotics
YAMADA, Noboru	Energy Engineering Thermal Engineering Optics and Photonics	1) Solar energy (photovoltaics and solar thermal applications) 2) Power generation from low-grade heat sources 3) Energy storage (mechanical battery, etc.) 4) Heat transfer

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
KATSUMI, Toshiyuki	Combustion Engineering Aerospace Engineering	1) Combustion energy 2) Combustion safety 3) Rocket propellant combustion
KIKUCHI, Takashi	Nuclear fusion science	1) Beam Physics and Engineering 2) Nuclear Fusion 3) Computational Science 4) Plasma Science
SASAKI, Toru	High Energy Density Physics Thermonuclear Fusion	1) High Energy Density Physics 2) Pulsed Power Generation 3) Thermonuclear Fusion 4) Plasma Science and Applications
SUZUKI, Tsuneo	Accelerator applications, novel material design	1) Chemical analysis by electrostatic accelerator 2) Light ion implantation 3) Novel material design and synthesis of new material
HAGA, Hitoshi	Power Electronics	Power Electronics
YOKOKURA, Yuki	Motion Control Motor Drive Robotics	1) Motion Control of Robotics and Mechanical System 2) High Performance Motor Drive 3) Vibration Suppression Control of Geared Motor System
OHTA, Tomoko	Environmental radioactivity	1) Environmental radioactivity 2) Groundwater dating 3) Forestry Hydrology 4) Backend
HIDAKA, Yuki	Motor, Motor drive Numerical simulation AI/AR applications	1) Development of high power, torque, efficiency motor 2) Advanced numerical simulation for motor designing using shape optimization, electrical circuit, mathematical model 3) Advanced motor design using AI/AR techniques

(2) Field of Study: Energy Materials Engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
ISHIBASHI, Takayuki	Condensed matter physics	1) Holographic 3D Display 2) Magnetic Thin Films 3) Superconducting Thin Films 4) Magneto-optical Effects 5) Magnetic Imaging

IMAKUBO, Tatsuro	Functional materials chemistry	1) Supramolecular solid state chemistry 2) Crystal design of organic conductors 3) Organic superconductors 4) Single-crystal device 5) Multi-functional organic conductors
UMEDA, Minoru *	Functional materials chemistry Functional materials devices	1) Electrochemical Energy Conversion 2) Polymer Electrolyte Fuel Cell 3) Secondary Battery 4) Organic Semiconductor
KOBAYASHI, Takaomi ***	Applied chemistry Polymer chemistry Functional materials Sonoprocesses Environmental chemistry Materials chemistry Biopolymer materials	1) Functional polymers with molecule recognition and separation 2) Sonoprocesses in Polymer Science 3) Intelligent materials 4) Applied Membrane Science 5) Biofunctional materials

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
SAITO, Nobuo	Functional materials chemistry Inorganic chemistry	1) Energy Conversion Materials 2) Functional Photocatalysts for Water Splitting 3) Removal of Heavy Metals Ion by Photocatalysis
SHIRONITA, Sayoko	Metal Surface Science	1) ChemistryPolymer Electrolyte Fuel Cell Materials 2) Safety of Secondary Battery Nano-sized Metal
TAGAYA, Motohiro	Energy Materials Engineering	1) Nano-Bio Materials 2) Biomaterials Engineering 3) Bioceramics 4) Mesoporous Materials 5) Calcium Phosphate Compounds
NISHIKAWA, Masami	Inorganic materials chemistry	1) Thin film processes 2) Functional thin films 3) Photoelectrode, Photocatalysts
HONMA, Tsuyoshi	Functional glass materials	1) Sodium Ion Batteries 2) Lithium Ion Batteries 3) Ionic Conductive Materials 4) Crystallization Mechanism of Glass Materials

(3) Field of Study: Environment Systems Engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
IKEDA, Takaaki	Geotechnical and earthquake engineering Strong ground motion seismology Disaster mitigation	1) Strong ground motion prediction 2) Source modeling 3) Nonlinear site effect 4) Seismic design
OHTSUKA, Satoru	Geotechnical Engineering Natural Disaster Prevention Engineering	1) Ground improvement technique against soil liquefaction 2) Soil water coupling stability analysis of earth structures 3) Stability evaluation of cut slope, landslide and artificial fill 4) Hazard maps for natural disasters by Geographic information system
SANO, Kazushi	Transportation Planning Traffic Engineering	1) Public Transportation System 2) Micro Traffic Simulation 3) Urban Supply Chain Management

SUGIMOTO, Mitsutaka *	Tunnelling Engineering Geotechnical engineering	1) Shield tunneling 2) Pipe jacking method 3) Reinforced soil
TAKAHASHI, Tsutomu	Fluids engineering	1) Rheo-optic behavior of complex fluids 2) Elongation flow behavior of complex fluids 3) Flow of surfactant solutions, cosmetics and slurries 4) Control and effective utilization of Flow-induced vibration 5) Energy harvesting from wind and river flow
TOYOTA, Hirofumi	Geotechnical engineering	1) Dynamic properties of soils 2) Mechanical properties of unsaturated soils 3) Slope stability during rainfall and earthquakes
NAKADE, Bumpei *	Urban planning	1) Land Use Planning 2) Town Planning in Local City 3) Master Plan 4) Zoning 5) Area Division
HOSOYAMADA, Tokuzo	Hydraulics Coastal and Ocean engineering Fluid mechanics	1) Numerical simulation of flows in river and coastal waves 2) Sediment transport due to waves and currents in river and coastal area 3) Flood and avalanche 4) Fluid forces on structures
YAMAGUCHI, Takashi	Civil and environmental Engineering Environmental technology, Environmental materials	1) Environmental Protection Engineering 2) Environmental Microbiology 3) Environmental Biotechnology 4) Water and Wastewater Engineering 5) Solid Wastes Technology
LI, Zhidong	System design for low-carbon society Energy and environmental policy	1) Low-carbon System 2) Energy Economics 3) Environmental Economics 4) Econometrics
LU, Minjiao	Hydrology Hydraulic engineering Natural disaster science	1) Hydrology 2) Hydrometeorology 3) Water Resources 4) Snow Engineering 5) GIS and remote sensing

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
INUKAI, Naoyuki	Hydraulics Coastal engineering Fluid mechanics Water rescue and survival research	1) Investigate cause of water accident for water rescue and survival by fluid mechanics process. 2) Field survey and simulation about nearshore wave and current. 3) Analysis tsunami dynamics. 4) Analysis Mekong river dynamics.
KUMAKURA, Toshiro	Meteorology Natural disaster science	1) Snow science 2) Model simulations on atmosphere and snow pack 3) Storm and snow disaster analysis 4) Development of meteorological and snow observation technique
KOMATSU, Toshiya	Environmental engineering	1) Solid and hazardous waste management 2) Biomass utilization technology 3) Environmental bioassay evaluation

SUZUKI, Masataro	Thermal engineering Fluid engineering	1) Fire Safety Engineering 2) Combustion 3) Reactive-Fluid Dynamics 4) Thermophoresis
TAKAHASHI, Kazuyoshi	Remote Sensing Engineering and GIS Agricultural Information Engineering	1) Airborne LiDAR measurement 2) Crop Growth monitoring and estimation
NAKAMURA, Fuminori	Maintenance management engineering Coastal engineering	1) Durability of concrete structures 2) Numerical simulation of coastal waves and winds
HATAMOTO, Masashi	Civil and environmental engineering Environmental biotechnology	1) Waste water treatment 2) Microbial community analysis 3) Environmental microbiology 4) Isolation and detection of microorganisms
HIMENO, Shuji	Civil and environmental engineering	1) Solid Waste Management 2) Sewerage Treatment 3) Chemical Engineering 4) Separation Engineering
FUKUMOTO, Yutaka	Geotechnical engineering	1) Computational geomechanics 2) Granular mechanics
MAKI, Shinya	Environmental biotechnology	1) Preservation technology of plant genetic resources 2) Food engineering 3) Horticulture technology 4) Water and Soil environmental technology
MATSUKAWA, Toshiya	Urban planning	1) Land Use Planning System 2) Town Planning in Local City 3) Master Plan 4) Zoning 5) Area Division
MATSUDA, Yoko	Disaster management	1) Participatory disaster planning 2) Disaster resilience 3) Case study and Fieldwork
YAMAZAKI, Wataru	Computational Fluid Dynamics Aerospace Engineering	1) Aerodynamic Design 2) Optimization Algorithms 3) Airfoil and Wing 4) Fluid Machinery

SPECIALLY APPOINTED ASSOCIATE PROFESSOR FOR ACADEMIA-INDUSTRY FUSION

NAME	RESEARCH FIELD	RESEARCH TOPICS
FUJISAWA, Kei	Mechanical and Information Engineering	1) Industrial IoT 2) Automation 3) Numerical simulation

4. Integrated Bioscience and Technology

Integrated Bioscience and Technology is the fourth course in our doctoral program. In recent years, biotechnology has accomplished rapid growth by integrating diverse scientific disciplines and technologies, such as chemistry, nanotechnology, and information science to solve the issues in human health and environment, the two major challenges that we are facing today. Integrated Bioscience and Technology course is aimed at generating individuals who integrate the knowledge in diverse scientific disciplines to develop novel ideas and technology to combat these modern problems. The staffs with the specialties in molecular and

cellular biology, chemistry, information science, and environmental science cooperate to create the research and education programs in the three fields, bio-molecular engineering, cellular bioengineering, and bio-system engineering as described below.

(1) Bio-molecular engineering

This research field's goal is the production and application of novel biomolecules and hybrid materials between natural and artificial molecules that are useful for human life. The faculty members in this group focus on: (1) de novo designing of proteins and their structural and biophysical analyses, (2) the creation of novel composite materials by means of the hybridization of bio-substances including natural polymers, and (3) the development of electrical devices that incorporate functional biomolecules.

(2) Cellular bioengineering

This research field is focused on the application of cellular function to accomplish better human life and global environment. The faculty members in this area are interested in the use of microbes for environmental remediation, environmental evaluation and utilization of biomass resources. The goal of this research area is to train individuals who have a broad understanding from genomics to ecology, and are able to contribute to the development of sustainable society.

(3) Bio-system engineering

This research field covers diverse disciplines contributing to the human welfare and health. The higher biological functions, such as perception, information processing, and environmental adaptation are investigated in order to provide the information and materials that are useful for health science and welfare. The staff members in this area train individuals who understand biology at molecular, cellular and system levels, and contribute to the generation of novel devices and materials for medical and other uses.

University Staff and Fields of Research

(1) Field of Study: Bio-molecular engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
KIDOKORO, Shun-ichi ***	Molecular Biophysics Protein Physics Statistical Biothermodynamics	1) Calorimetric evaluation of protein stability and molecular function 2) New methodology for the analysis of the physical properties and function 3) Rational molecular design of biological nanomachine

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
KIMURA, Noritaka	Polymer/textile materials	1) Structure and Properties of Cellulosic Derivatives and Mushroom Polysaccharides 2) Computer Simulation of Polysaccharides 3) Photobleaching of Japanese Paper

KUWAHARA, Takashi	Bioelectrochemistry	1) Hybridization of synthetic polymers and bio-related substances 2) Modification of solid surface with bio-related substances (Application to biosensors and biofuel cells)

(2) Field of Study: Cellular bioengineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
OGASAWARA, Wataru	Biorefinery Development of filamentous fungi Cellulosic Biomass Microbial genome analysis Cellulose and Protease	1) Biorefinery 2) Biomass 3) Fungi 4) Bio-ethanol 5) Cellulose
TAKAHASHI, Shouji	Applied Biochemistry Applied Microbiology	1) Engineering and application of D-amino acid-metabolizing enzymes 2) Microbial degradation of environmental pollutants 3) Molecular breeding of biotechnologically valuable yeasts
MASAI, Eiji	Applied Microbiology	1) Bacterial catabolism of aromatic compounds, including lignin-derived compounds 2) Microbial technology for woody biomass (lignin) utilization

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
KASAI, Daisuke	Applied Microbiology	1) Biodegradation of environmental pollutants 2) Microbial degradation of rubber
TAKAHARA, Yoshinori	Breeding science	1) Plant Biotechnology 2) Molecular Marker Assisted Selection 3) Genetic Transformation 4) Evolution
NISHIMURA, Taisuke	Plant molecular genetics	1) Plant genetic engineering 2) Genomics 3) Epigenetics 4) Reprogramming

(3) Field of Study: Bio-system engineering

PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
SHIONOYA, Akira ***	Sports science and sports engineering Dynamics / Control	1) Development of the parallel measurement system for Mechanical parameter and physiological parameter 2) Development of the floating biofeedback system for mental health 3) Development of the Anaerobic Threshold Determination System 4) Development of sport-type wheel-chair
TAKIMOTO, Koichi	Molecular physiology Cell biology	1) EAG2 channel and cancer cell growth 2) Novel drugs affecting K+ channel inactivation 3) Plant-derived chemicals influencing adipogenesis
TSUBONE, Tadashi	Bio-system engineering	1) Nonlinear System Design 2) Nonlinear System Analysis

NAKAGAWA, Masahiro **	Sensibility informatics Soft computing	1) Chaos& Fractals Informatics 2) Brain Function Measurements 3) Brain Affective Interface 4) Sensibility Informatics and Technology 5) Chaos Neuro-Computing 6) Fractal Image Coding 7) Chaos and Fractal Bioassay
HONDA, Hajime ***	Cell Motility Biomotor Devices	1) Motor Protein 2) Fluorescent Microscopy 3) Biosensor Device 4) LSI
WADA, Yasuhiro *	Computational neuroscience	1) Computational Neuroscience 2) Brain-style Information Systems 3) Motor planning and optimal control 4) Motor learning and Modularity 5) Brain Machine Interface

ASSOCIATE PROFESSORS

NAME	RESEARCH FIELD	RESEARCH TOPICS
AKIMOTO, Yoritaka	Cognitive Psychology, Cognitive Neuroscience	1) Neuroimaging 2) Language Comprehension 3) Social Cognition
OHNUMA, Kiyoshi	Tissue engineering Regenerative medicine	1) Human induced pluripotent stem cells (iPSCs) 2) Microfabrication, Microfluidic 3) Development and differentiation
SATO, Takeshi	Glycobiology Molecular Biology Functional Biochemistry	1) Development of effective system for Suppression of malignant properties of cancer cells by manipulation of transcription factors 2) Elucidation of transcriptional mechanisms of glycogens 3) Study on effects of anti-cancer drugs on glycan structures
SHIMODA, Yasushi	Neuroscience Biochemistry	1) Cell adhesion molecules in the regulation of neural function 2) Mechanism of psychiatric and developmental disorders 3) Regulation of neural function by protein engineering
NAMBU, Isao	Neural Engineering Biosignal Processing	1) Neuroimaging 2) Brain-Machine/Computer Interfaces 3) Body-Machine Interfaces
FUJIWARA, Ikuko	Actin polymerization and depolymerization dynamics Regulatory mechanism for cytoskeleton Molecular mechanism of cell motility	1) Total Internal Reflection Fluorescence Microscope 2) Individual actin filaments polymerization and depolymerization 3) Real time observation of protein binding and dissociation related with cytoskeleton and cell motility
YAMAMOTO, Maki	Wild life Management Bio-logging Conservative Biology Ecology	1) Field Study for Wild Animals Using Bio-logging technique 2) GIS Analysis for Wildlife Management

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