

Graduate School of Advanced Science and Engineering (Master's Course / Doctoral Course)  
Division of Advanced Science and Engineering  
Lists of Academic Supervisors

September 1, 2025

(Note 1) The following lists are current as of the above date, and include faculty members who may not be able to accept students due to retirement or other reasons at the time of admission.

(Note 2) The faculty members marked with \* can only accept Master's students as of the above date, and they cannot accept Doctoral students.

**Science Programs**

**Mathematics Program**

| Specialty                                      | Research Fields                                                                                                                                                                                                                                                                                              | Academic Staff                                                                                                |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Algebra                                        | Number Theory, Algebraic Geometry, Arithmetic Geometry, Motives, Singularities, Group Theory, Representation Theory, Commutative Algebra, Coding Theory, Cryptography.                                                                                                                                       | SHIMADA, Ichiro<br>KIMURA, Shun-ichi<br>TAKAHASHI, Nobuyoshi                                                  |
| Geometry and Topology                          | Differential Geometry, Topology, Manifolds, 3 and 4 Dimensional Mathematics, Knots, Hyperbolic Geometry, Homogeneous Spaces, Symmetric Spaces, Representation Theory of Lie Groups, Singularities.                                                                                                           | ISHIHARA, Kai<br>FUJIMORI, Shoichi<br>OKUDA, Takayuki<br>MURAO, Tomo<br><u>TERAGAITO, Masakazu</u>            |
| Mathematical Analysis                          | Differential Equations, Nonlinear Analysis, Dynamical Systems, Potential Theory, Real Analysis, Scattering Theory.                                                                                                                                                                                           | KAWASHITA, Mishio<br>NAITO, Yuki<br>TAKIMOTO, Kazuhiro<br>HIRATA, Kentaro<br>SHIMOMURA, Tetsu<br>IKEHATA, Ryo |
| Probability Theory and Mathematical Statistics | Probability Theory, Stochastic Processes, Stochastic Calculus, Random Fields, Stochastic Partial Differential Equations, Theory for Multivariate Data Analysis and its Applications, Statistical Inference, Asymptotic Expansion for Statistical Distributions, Resampling Methods, Mathematical Statistics. | WAKAKI, Hirofumi<br>OKAMOTO, Mamoru<br>IMORI, Shinpei<br>ODA, Ryoya                                           |
| Mathematical Sciences                          | Differential Geometry, Differential Equations, Bayesian Statistics, Knot Theory                                                                                                                                                                                                                              | MIZUMACHI, Tetsu<br>HASHIMOTO, Shintaro<br>SHIBUYA, Kazuhiro<br><u>KOTORII, Yuka</u>                          |

The underlined faculty members are those who will be in charge of the specific program "International Program for Collaborative Sciences Enabling the Future".

If you are planning to study under them, please confirm the following information.

[International Program for Collaborative Sciences Enabling the Future](#)

## Physics Program

| Specialty                               | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Academic Staff                                                                                                                                       |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theoretical Particle and Hadron Physics | Quest for fundamental law of elementary particle and hadron physics. Physics of mesons and baryons. Lattice QCD. Effective theory of QCD. QCD phase diagram, Phenomenological analyses on relativistic heavy ion collisions. Dynamical symmetry breaking. Origin of mass and CP violation.                                                                                                                                                                                                                                                                   | <u>NONAKA, Chiho</u><br>MOROZUMI, Takuya<br>ISHIKAWA, Ken-ichi<br>INAGAKI, Tomohiro                                                                  |
| Astrophysics                            | Theoretical and observational research on astrophysics. The main research fields are as follows.<br>Gravitational lensing, observational cosmology, dark matter, baryonic physics, galaxy clusters, black holes, neutron stars, pulsar magnetosphere, particle acceleration, gravitational waves, gravitational-wave cosmology, tests of gravity in extreme environments, and fundamental particle searches.                                                                                                                                                 | OKABE, Nobuhiro<br>NISHIZAWA, Atsushi<br>KISAKA, Shota*                                                                                              |
| Quark Physics                           | Experimental study of an exotic state of matter, quark-gluon plasma, utilizing nuclear collisions at the energy frontier. Investigation of properties and space-time evolution of such a quark matter, which filled the universe in 10 microseconds after the Big-Bang. Search for dark matter/energy and new phenomena arising from ultra-intense fields. Computational magneto-hydrodynamics and interdisciplinary plasma physics. R&D of new particle detectors. High-performance computing and data analysis.                                            | <u>SHIGAKI, Kenta</u><br>YAMAGUCHI, Yorito<br>HOMMA, Kensuke<br>MIYOSHI, Takahiro*<br>YANO, Satoshi*                                                 |
| High-Energy Astrophysics                | Study of high-energy astrophysical phenomena through cosmic X-ray and gamma-ray observations with Fermi GeV gamma-ray satellite, X-ray satellites, TeV gamma-ray telescopes, and so on. Astronomical objects of interest are neutron stars, black holes of various masses, supernova remnants, galaxies and clusters, and gamma-ray bursts. Together with Kanata telescope, multiwavelength and multimessenger observations are performed. Future X-ray and gamma-ray projects. Development of new radiation detectors is also an important research target. | FUKAZAWA, Yasushi<br>MIZUNO, Tsunefumi<br>TAKAHASHI, Hiromitsu<br>SUDA, Yusuke*                                                                      |
| Optical and Infrared Astronomy          | We study astrophysical phenomena, mainly based on optical and infrared observations, using our 1.5m 'Kanata' Telescope at the Higashi-Hiroshima Observatory, the James Webb Space Telescope, and other facilities. These data are further combined with multi-wavelength observations taken with the ALMA observatory and X-ray/gamma-ray satellites. We also promote research and development of new astronomical instruments, including future telescopes and satellites.                                                                                  | KAWABATA, Koji<br>UEMURA, Makoto<br>INAMI, Hanae                                                                                                     |
| High Energy Physics                     | Study of fundamental principles of nature in following two fields.<br>Experimental Particle Physics using High Energy Accelerators:<br>Research in physics, detector and accelerator development, aiming to reveal how our universe began.<br>Quantum Physics :<br>Deeper understanding quantum physics, as a language to describe microscopic worlds.                                                                                                                                                                                                       | TAKAHASHI, Tohru<br>IINUMA, Masataka*                                                                                                                |
| Structural Physics                      | Electron charge density study of ferroelectric and related materials by using synchrotron radiation. X-ray and neutron crystal structure analysis to study the phase-transition mechanism and relationship between crystal structure and physical properties.                                                                                                                                                                                                                                                                                                | KUROIWA, Yoshihiro<br>MORIYOSHI, Chikako<br>KIM, Sangwook*                                                                                           |
| Electronic Properties of Solids         | Study of correlation between electronic states and physical properties in magnetic materials and/or dielectric materials by means of X-ray spectroscopy (XAS, MCD, XLD, PES, XES) and X-ray diffractometry using synchrotron radiation. Investigation of the physical properties under extreme conditions.                                                                                                                                                                                                                                                   | NAKAJIMA, Nobuo                                                                                                                                      |
| Synchrotron Radiation Physics of Solids | Studying topologically non-trivial electronic band structures of Weyl semimetals, nodal-line semimetals and related spintronic materials by spin- and angle- resolved photoelectron spectroscopy utilizing synchrotron and laser radiation. Unraveling origins of superconductivity, metal-insulator transition and multipoles in strongly correlated systems.                                                                                                                                                                                               | <u>KIMURA, Akio</u><br><u>KURODA, Kenta</u>                                                                                                          |
| Molecular Photoscience                  | Atomic-level elucidation of functions, properties, and reaction dynamics of nanomaterials and bio molecules using advanced quantum beams such as synchrotron radiation, free electron lasers, and ultrafast pulsed lasers. Interdisciplinary physics with chemistry and biology based on the interaction between light and matter. Basic research on synthesis of new materials.                                                                                                                                                                             | SEKITANI, Tetsuji<br>WADA, Shin-ichi                                                                                                                 |
| Synchrotron Radiation Materials Science | Investigation of electronic and spin structures of materials by high-resolution photoemission spectroscopy, highly efficient spin- and angle-resolved photoemission spectroscopy, and soft X-ray magnetic circular dichroism using synchrotron radiation (SR) in the ultraviolet and soft X-ray region, study of biomolecule structures using vacuum-ultraviolet circular-dichroism spectroscopy, and the development of advanced SR instruments for materials science at Research Institute for Synchrotron Radiation Science (HiSOR).                      | NAMATAME, Hirofumi<br>OKUDA, Taichi<br>SHIMADA, Kenya<br>IDETA, Shin-ichiro<br>MATSUO, Koichi<br>MIYAMOTO, Koji<br>SATO, Hitoshi<br>SAWADA, Masahiro |

Note: The faculty members marked with \* are only in charge of Master's Course.

| Specialty                        | Research Fields                                                                                                                                                                                                                                         | Academic Staff  |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Physics of Synchrotron Radiation | Researches on particle accelerators, particularly synchrotron light sources. Beam physics studies on electron dynamics and electromagnetic radiation in synchrotrons. Researches and developments of accelerator technology for advanced light sources. | KATOH, Masahiro |

Supervisor below in charge of plural programs takes charge of the program in the following table, including this program.

| Program                                           | Research Fields                                                                           | Academic Staff                                          |
|---------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Transdisciplinary Science and Engineering Program | Static and dynamic structures and physical properties of structurally disordered matter   | INUI, Masanori<br>(Retirement at the end of March 2026) |
|                                                   | Quantum information theory concerning e.g. quantum entanglement and quantum communication | ISHIZAKA, Satoshi                                       |
|                                                   | Crystal growth and pattern formation of softmatter                                        | TAGUCHI, Ken                                            |
|                                                   | Physics of complex systems, such as active matter and non-equilibrium ordering            | TANAKA, Shinpei                                         |
|                                                   | Physics Education Research, Molecular Dynamics Simulation of Liquids                      | MUNEJIRI, Shuji                                         |
|                                                   | Physics of Disordered Materials (liquids and glasses)                                     | KAJIHARA, Yukio                                         |
|                                                   | Circuit quantum gravity theory concerning e.g. circuit analogue black holes               | KATAYAMA, Haruna*                                       |

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### Earth and Planetary Systems Science Program

| Specialty                            | Research Fields                                                                                                                                                                                                                                                                                                                                                       | Academic Staff                                                                                                                                                                                                                                    |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Earth and Planetary Material Science | Tectonics of East Asia, Continental evolution, Deformation microstructure, Internal structure of the Earth, Mineral physics, Water-rock interaction, Crystal chemistry                                                                                                                                                                                                | ANDO, Jun-ichi<br>KATAYAMA, Ikuo<br>DAS, Kaushik<br>OKAZAKI, Keishi<br>OKAWA, Makio                                                                                                                                                               |
| Earth and Planetary Chemistry        | Magma genesis, Astrobiology, Space exploration, Earth environmental change, Microbial mineralization, Planetary collision process, Thermochemical state of Earth's oceanic plate                                                                                                                                                                                      | SHIBATA, Tomoyuki<br>SHIRAISHI, Fumito<br><u>YABUTA, Hikaru</u><br>AKIZAWA, Norikatsu<br>KOIKE, Mizuho<br>MIYAHARA, Masaaki                                                                                                                       |
| Earth and Planetary Physics          | Slow earthquake, Material transport, Mantle convection, Deep magma genesis, Deep Earth water, Deep Earth Rheology, High pressure hydrous minerals                                                                                                                                                                                                                     | INOUE, Toru<br>SUDA, Naoki<br>KAWAZOE, Takaaki<br>NAKAKUKI, Tomoeiki                                                                                                                                                                              |
| Integrated Earth and Ocean Sciences  | Geochemical cycles and environmental changes recorded in sedimentary rocks<br>Microbiological and geochemical explorations of subseafloor biosphere<br>Physico-chemical processes in earthquake fault zones<br>Development of analytical techniques of isotopes and trace elements in core samples<br>Diversity and ecology of microbes inhabiting the deep-biosphere | ISHIKAWA, Tsuyoshi<br>(Visiting Prof.)<br>TOMIOKA, Naotaka<br>(Visiting Prof.)<br>HIROSE, Takehiro<br>(Visiting Prof.)<br>MORONO, Yuki<br>(Visiting Prof.)<br>HOSHINO, Tatsuhiko<br>(Visiting Prof.)<br>Nakada, Ryoichi<br>(Visiting Assoc.prof.) |

Supervisor below in charge of plural programs takes charge of the program in the following table, including this program.

| Program                                           | Research Fields                                                                                           | Academic Staff     |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------|
| Transdisciplinary Science and Engineering Program | Hydrologic transport of earth surface materials: hydrogeomorphology and biogeochemistry                   | ONODERA, Shin-ichi |
|                                                   | Thermodynamics of the global climate and fluid systems, dissipative structures of non-equilibrium systems | OZAWA, Hisashi     |
|                                                   | Environment-geology-ecosystem interactions in terrestrial to coastal waters                               | SAITO, Mitsuyo     |
|                                                   | Reaction and transport relevant to rock weathering                                                        | YOKOYAMA, Tadashi  |

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## Chemistry Program

| Specialty                            | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Academic Staff                                                         |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Structural Physical Chemistry        | Laser spectroscopic studies on a variety of molecular ions (host-guest complexes, chemical intermediates, cluster compounds, etc.) isolated under cold gas-phase conditions.                                                                                                                                                                                                                                                                                                                                                                                              | INOKUCHI, Yoshiya<br>MURAMATSU, Satoru                                 |
| Solid Material Chemistry             | Synthesis, crystal structure, magnetic, optical, and conducting properties for molecule-based materials, studied by SQUID, magnetic resonance, MCD, and X-ray diffraction. Studies on materials development using synthetic chemical methods (organic synthesis, coordination synthesis, Polymer synthesis, etc.). In addition, research on the development of materials showing physical properties that are inaccessible with single molecules. In particular, research on material synthesis and functional investigation focusing on porous and mechanical functions. | <u>INOUE, Katsuya</u><br><u>LEONOV, Andrey</u><br><u>SATO, Hiroshi</u> |
| Integrated Chemistry                 | Synthesis, architecture, and physical characteristics of functional molecules inspired by biological functions. Design and development of devices with integrated functional molecules.                                                                                                                                                                                                                                                                                                                                                                                   | NISHIHARA, Sadafumi                                                    |
| Coordination Chemistry               | Preparation, structures, and properties of transition metal complexes having phosphorus ligand(s) with novel functionality. Activation of small molecules at interfaces based on metal-ligand interaction.                                                                                                                                                                                                                                                                                                                                                                | MIZUTA, Tsutomu<br>KUME, Shoko                                         |
| Analytical Chemistry                 | Studies on the physical and chemical responses or phenomena of single particles levitated in air by means of a laser trapping technique.                                                                                                                                                                                                                                                                                                                                                                                                                                  | ISHIZAKA, Shoji<br>MATSUBARA, Hiroki<br>MIYAGAWA, Akihisa*             |
| Organic Stereochemistry              | Study on the developments of supramolecular assembly and polymer generated from hetero- and homotopic monomers linked through multiple non-covalent forces, and their innovative functions.                                                                                                                                                                                                                                                                                                                                                                               | <u>HAINO, Takeharu</u><br>HIRAO, Takehiro                              |
| Photochemistry of Advanced Materials | Advanced nanomaterials synthesis based on physical chemistry method. Optoelectrical properties of nanostructured material. Development of basic structure for next-generation photovoltaic and LED. Optical properties of condensed phase.                                                                                                                                                                                                                                                                                                                                | SAITOW, Ken-ichi                                                       |
| Physical Chemistry of Kinetics       | Experiments based on the selective detection of a single quantum state of atoms and molecules by laser spectroscopy. Studies on the kinetics and dynamics of the chemical reactions and energy transfer processes in atomic and molecular collisions.                                                                                                                                                                                                                                                                                                                     | KOHGUCHI, Hiroshi                                                      |
| Quantum Chemistry                    | Studies on the electronic states and reactions of excited molecules induced by X-ray photons or electron impact. Solvation structure of solutes revealed by soft X-ray spectroscopy.                                                                                                                                                                                                                                                                                                                                                                                      | OKADA, Kazumasa                                                        |
| Synthetic Organic Chemistry          | New reactions-, new reagents-, and new catalysts-based synthetic organic chemistry, and creation of new functional molecules therefrom. Studies on the synthesis and reaction mechanism of organic compounds of main group elements. Chemistry of hypervalent molecules.                                                                                                                                                                                                                                                                                                  | YOSHIDA, Hiroto<br>NAKAMOTO, Masaaki                                   |
| Organic Reaction Chemistry           | Organic photochemistry, reactive intermediate chemistry, synthesis of biologically active compounds, artificial Photosynthesis, photochemistry of metal complexes. Synthetic chemistry of $\pi$ -conjugated middle molecules and macromolecules with new structures.                                                                                                                                                                                                                                                                                                      | ABE, Manabu<br>ISHITANI, Osamu<br>KAYAHARA, Eiichi<br>TAKAGI, Ryukichi |
| Radiation Reaction Chemistry         | Chemistry related to radiation or studied by Mössbauer spectroscopy. Control of mixed-valence state and spin state by crystal construction. Study on environmental radioactivity and study for decontamination of radioactive cesium.<br>Chemistry related to radiation and radioactive materials. Environmental chemistry, chemistry of exotic atoms and development of a new analysis method using radiation.                                                                                                                                                           | NINOMIYA, Kazuhiko                                                     |

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## Engineering Programs & Informatics and Data Science Program

### Applied Chemistry Program

| Specialty                                     | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                               | Academic Staff                                                             |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Organic Supramolecular Chemistry              | Education and research on development of synthetic reactions and supramolecular complexes applied for creating functional organic molecules in everyday life, medicinal field, and high technology.                                                                                                                                                                                                                           | IKEDA, Atsushi<br>KAWASAKI, Riku                                           |
| Polymer Chemistry                             | Education and research on polymer chemistry, especially, precision polymerization catalyzed by transition metal complex and development of new polymers from renewable biomass.                                                                                                                                                                                                                                               | OSAKA, Itaru<br>(Concurrent post)<br>NAKAYAMA, Yuushou<br>TANAKA, Ryo      |
| Organic $\pi$ -Conjugated Materials Chemistry | Education and research on novel organic functional and semiconducting materials such as $\pi$ -conjugated polymers, and their application to energy and/or electronic devices such as organic solar cells. Education and research on novel organic synthetic methodology by developing new reactions, reagents, and catalyst, and their application to syntheses of various organic functional materials and pharmaceuticals. | OSAKA, Itaru<br>MIKIE, Tsubasa*                                            |
| Functional Dye Chemistry                      | Development of novel functional dye and polymer materials with epoch-making optoelectronic characteristics, fluorescence sensing ability and therapeutic activity. Education and research on new functions of organic/inorganic materials and their applications to novel electronic/optoelectronic devices                                                                                                                   | OYAMA, Yousuke<br>IMAE, Ichiro<br>IMATO, Keiichi<br>KOMAGUCHI, Kenji       |
| Inorganic and Hybrid Materials Chemistry      | Research and education on ceramics, with main interests on molecular design, synthesis, characterization, and applications of new inorganic or inorganic-organic hybrid materials having functional nano-structures.                                                                                                                                                                                                          | INUMARU, Kei<br>KATAGIRI, Kiyofumi<br>TARUTANI, Naoki<br>FUKUOKA, Hiroshi* |
| Catalytic Materials Chemistry                 | Synthesis and characterization of novel functional metal oxide materials such as metal oxide clusters, zeolites, and related materials, and their application to catalysts and adsorbents in environmental and energy research fields.                                                                                                                                                                                        | SADAKANE, Masahiro<br>MINATO, Takuo*                                       |

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| Program                                      | Specialty                                 | Research Fields                                                                                                                                                                                                            | Academic Staff                            |
|----------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Smart Innovation Program (Applied Chemistry) | Element-Based Organic Materials Chemistry | Education and research on element-based materials, in particular synthesis and applications of polymers with inorganic elements, and development of functional materials with epoch-making optoelectronic characteristics. | OHSHTA, Joji<br>ADACHI, Yohei             |
|                                              | Computational Materials Science           | Education and research on computational chemistry, in particular understanding of chemical and physical phenomena based on molecular simulation and applications using data science.                                       | ISHIMOTO, Takayoshi<br>KANEMATSU, Yusuke* |

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### Chemical Engineering Program

| Specialty                                 | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                    | Academic Staff                                                                                  |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Thermal-Fluid Engineering                 | Development of self-healing coating for industrial materials, printable electronics using metal complex (conductive, power storage, power generation materials). Synthesis of nanoparticles and nanostructured particles.                                                                                                                                                                                                          | OGI, Takashi<br>HIRANO, Tomoyuki                                                                |
| High-Pressure Fluid Property              | Measurement and modeling of the equilibrium and transport properties for supercritical fluid + polymer systems. Development of innovative material processing technology for functional organic and inorganic materials utilizing particular characteristics of supercritical fluids.                                                                                                                                              | OGI, Takashi<br>(Concurrent post)<br>USHIKI, Ikuro                                              |
| Soft Materials Processing                 | Basic research to elucidate the relationship between engineering processing, hierarchical structuring, and functionalization of soft materials (polymers such as plastics and rubbers) through measurement and modeling of their physical properties, and applied research to create functional organic and inorganic materials using these materials.                                                                             | NAKAI, Satoshi<br>(Concurrent post)<br>KIHARA, Shinichi                                         |
| Separation Technology                     | Development and characterization of nano- or subnano-porous ceramic membranes, and their application to gas separation, pervaporation / vapor permeation, nanofiltration / reverse osmotic processes, and catalytic membrane reactors. Sol-gel and plasma-enhanced CVD for functionalized materials. Transport mechanism of gas/liquid molecules through microporous membranes. Evaluation of membrane-based separation processes. | KANEZASHI, Masakoto<br>NAGASAWA, Hiroki                                                         |
| Fine Particle Technology                  | Development of novel high-performance classification system. Development of powder treatment process using microwave heating method. Improvement and life prediction of bag filter system. Analysis of particle dispersed system by DEM-DNS and DEM-CFD simulation. Evaluation of physical and chemical particle property. Application of zeta potential measuring device and vibration fluidized bed.                             | FUKUI, Kunihiro<br>ISHIGAMI, Toru<br>FUKASAWA, Tomonori                                         |
| Interfacial Systems Process Engineering   | Synthesis and fabrication of fine materials and micro-controlled surfaces by the generation and transport of gasborne matter; contamination phenomena induced by particulate matter and gaseous matter; development of synthetic process of organic-inorganic hybrid porous materials; investigation of mechanism of particle formation and assembly in small droplets.                                                            | SHIMADA, Manabu<br>KUBO, Masaru                                                                 |
| Sustainable Materials Process Engineering | Development of self-healing coating for industrial materials, printable electronics using metal complex (conductive, power storage, power generation materials). Synthesis of nanofibers, nanogel and biomaterials using self-organisation technology.                                                                                                                                                                             | YABUKI, Akihiro                                                                                 |
| Green Process Engineering                 | Education and research on treatment of waste and wastewater, evaluation of environmental impacts of the human activities and its reduction by greenization of chemical processes, and ecological engineering for conservation and restoration of damaged ecosystems.                                                                                                                                                               | NISHIJIMA, Wataru<br>NAKAI, Satoshi<br>GOTOH, Takehiko<br>UMEHARA, Akira<br>SUENAGA, Toshikazu* |

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### Electrical, Systems, and Control Engineering Program

| Specialty                        | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Academic Staff                                                                                                  |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Social Informatics               | Research and simulation analysis on the fundamental technologies of artificial adaptive agent models.<br>Analytical studies based on game theory regarding equilibrium and consensus among decision-makers such as individuals and organizations, and development of decision-making methods.<br>Optimization of social systems (electric power systems) using optimization techniques such as mathematical optimization and evolutionary computation to design optimal next-generation social systems.                                                           | HAYASHIDA, Tomohiro<br>SEKIZAKI, Shinya                                                                         |
| Production Systems Engineering   | Research on design, planning and control techniques of large-scale, complicated manufacturing systems and supply chains. Some research topics are the utilization of human capability as a fundamental element of the production system, the development of manufacturing systems which adapt to the change of manufacturing environment, the application of optimization and simulation techniques for planning facility, production-distribution-inventory systems, and service systems, and the development of scheduling techniques.                          | MORIKAWA, Katsumi                                                                                               |
| Mathematics                      | Research on inverse problems of differential equations. Mathematical analysis of linear PDEs.<br>Dynamical systems and ergodic theory.<br>Research on nonlinear elliptic and parabolic differential equations, and applications to the dynamical system and phenomenological theory.<br>Statistical physics of neural networks.                                                                                                                                                                                                                                   | TSUGE, Naoki<br>YOSHIKAWA, Shuji<br>KAWASHITA, Wakako<br>CHUNG, Yong Moo<br>WAKASUGI, Yuta<br>UCHIYAMA, Satoki* |
| Electric Power and Energy System | Research on large-scale, complex and nonlinear electric power systems, including problems of operation, planning, stability analysis, and control. Recent topics include the construction of smart microgrid using new type of converter under development (hardware) and its control technologies (software). Keywords: renewable energy, distributed power generation, battery, vehicle-to-grid, optimization technique, artificial intelligence (AI) application, control system design, analysis technology, reliable ICT application, algorithm development. | ZOKA, Yoshifumi<br>SASAKI, Yutaka<br>TAOKA, Satoshi                                                             |
| Biological Systems Engineering   | Research on the measurement, analysis, and modeling of biological functions, as well as their engineering applications. Our goal is to expand human potential and contribute to a more vibrant society through a deeper understanding of sensory, motor, and brain functions. Key areas of focus include biomedical signal processing, human-machine systems, haptics, virtual reality, human interaction, medical engineering, human augmentation, and brain-tech systems.                                                                                       | KURITA, Yuichi<br>SOH, Zu<br>TAKEMI, Mitsuaki                                                                   |
| Applications of Cybernetics      | Research on the modeling and application of a complicated phenomenon. For example, measurement and diagnosis for the living body information and system integration, engineering application, etc.                                                                                                                                                                                                                                                                                                                                                                | KOMINE, Hidehiko<br>MIYATA, Natsuki                                                                             |

Supervisor below in charge of plural programs takes charge of the program in the following table, including this program.

| Program                                                                 | Specialty                   | Research Fields                                                                                                                                                                                                                                                                                                  | Academic Staff                                                               |
|-------------------------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Smart Innovation Program (Electrical, Systems, and Control Engineering) | Control Systems Engineering | Research and education on system control technology and digital signal processing. Specifically, adaptive & learning control system technology for industrial systems, Cyber-Physical Systems (CPS), Model Based Development (MBD) and digital signal processing for communication systems and image processing. | YAMAMOTO, Toru<br>WAKITANI, Shin<br>KINOSHITA, Takuya<br>NAKAMOTO, Masayoshi |
|                                                                         | Smart Robotics              | Research on hyper-human robotics technology exceeding man's capability, and its real world applications. For example, high-speed robot vision, robot mechanism design, mobile robot, sensor-based manipulation, multimedia applications, industrial applications, medical applications, bio-applications, etc.   | ISHII, Idaku<br>TAKAKI, Takeshi<br>AMBE, Yuichi<br>SHIMASAKI, Kohei*         |

# Mechanical Engineering Program

| Specialty                                     | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Academic Staff                       |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Machinery Dynamics                            | Analysis, design, control, and simulation of mechanical systems, such as robotics and mechatronics systems. Specific themes include: force control and teleoperation for industrial robots; safer control techniques for robots collaborating with humans; teleoperation of bipedal robots; control and motion planning for hydraulic excavators; periodic/asperiodic separation for control and diagnosis; development of mobile robots; and analysis and control of human-robot interaction.                                                                                                                                                                                                                                              | KIKUUWE, Ryo<br>MURAMATSU, Hisayoshi |
| Mechanics of Materials                        | Experimental study on impact thermo-mechanical and fracture behavior of materials with phase transformation and characterization by observation of microstructure; Development of new members with high collision energy absorption by using material with high impact energy absorption; Development and modification of impact testing methods; Multi-scale analysis of steel with phase transformation based on the homogenization technique; Dislocation mechanics by the microforce concept and coupling with a transformation-crystal plasticity theory; Simulation of interface motion driven by phase transformation using microforce balance equation; Mesh free method such as GIMP for impact and phase transformation problems. | IWAMOTO, Takeshi                     |
| Control Engineering                           | Analysis and control of dynamical systems including robust control, model predictive control, optimal control, nonlinear control, and their applications to mechanical systems, biological networks, and privacy mechanism design.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | WADA, Nobutaka<br>KAWANO, Yu         |
| Machine Intelligence and Systems A            | Realization of machine intelligence. In particular, the collective intelligence generation, control and analysis based on the concept of decentralized autonomous systems by building swarm robotic systems or conducting large-scaled computer simulations with emerging techniques in the field of biomimetics and computational intelligence.                                                                                                                                                                                                                                                                                                                                                                                            | OHKURA, Kazuhiro                     |
| Machine Intelligence and Systems B            | Research on design, planning and control of manufacturing systems; Research on optimum/intelligent production planning and scheduling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | EGUCHI, Toru                         |
| Mechanical Design and Systems                 | Three-dimensional measurement of the motion of machine tools and its control; Kinematic modelling of machine tools and robots and error diagnosis; Three-dimensional geometric measurement; Monitoring and intelligent control of machining processes; Strength, failure analysis and design of gear drives; Simulation of gear vibration and noise; Development and design of a new-type gear with higher strength and performance than that of the Involute gear; Estimation and improvement of power transmission performance of gear and traction drives; Improvement in performance of gear pumps; Design and tribology of various machine elements.                                                                                   | IBARAKI, Soichi<br>IKEJO, Kiyotaka   |
| Machining and Machining System                | The sensing technology and the components for machine tools; Machining for the difficult-to-cut materials; Development of the free-cutting steels and the new cutting tools; Laser assisted machining process; Laser processing of brittle materials.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | YAMADA, Keiji<br>TANAKA, Ryutaro     |
| Materials Physics                             | Elucidation of physics phenomena in development and laser precision machining of high-functional and high-performance advanced material, Data-driven material development combining high-precision structural observation/structural quantification with machine learning, Optimization of material development and processing by structural control, Material development and high-performance processing using numerical simulations (first-principles calculation, Monte Carlo method, finite element method, etc.).                                                                                                                                                                                                                     | OKAMOTO, Yasuhiro<br>SUGIO, Kenjiro  |
| Properties Control for Mechanical Materials   | Analyses and micro-macro modeling for materials fabrication process, and development of materials property control by their techniques: (1) Casting using the material control technology, the alloying using the sintering method, and a diplo-phasing and compositing; (2) Thermal and mechanical conditions of the material engineering quality of the material by the analysis of a material process, research-and-development; (3) Nano-meso scale by the mechanical engineering techniques, such as control of the dynamic or control.                                                                                                                                                                                                | MATSUGI, Kazuhiro<br>CHOI, Yongbum   |
| Strength and Fracture of Mechanical Materials | The microscopy of the fatigue crack growth mechanism by using high-resolution microscope; The evaluation of material strength of advanced structural materials; Evaluation of fatigue strength and damage mechanism of joints welded by various joining methods (resistance spot welding, laser welding, friction stir welding, adhesive joining); Establishment of fatigue life estimation method under actual loading; Nondestructive inspection and fatigue damage evaluation of joints using infrared measurement.                                                                                                                                                                                                                      | AKEBONO, Hiroyuki<br>OGAWA, Yuki     |

Note: The faculty members marked with \* are only in charge of Master's Course.

| Specialty                                               | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Academic Staff                                     |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Materials Forming Science and Engineering               | Experimental investigation of elastic-plastic (or viscoplastic) behavior and fracture limit of metallic materials, Material modeling and material parameter identification based on theory of elasto-plasticity, Prediction of forming limit and springback of difficult-to-form sheet metals, Hot and warm incremental forming, Numerical analysis and optimization problems in metal forming, Development of linear friction welding for joining dissimilar materials.                                                                                                                                                                                         | HINO, Ryutaro<br>CHOI, Jeongwon*                   |
| Materials Joining Science and Engineering               | Development of high-quality/high-efficiency welding and joining processes using hot-wire method with several heat sources (laser, GMA and GTA); Evaluation of hot cracking susceptibility and elucidation of mechanism of hot cracking during welding using in-situ observation technique with high-speed cameras and multi-sensor camera; Prediction of hot cracking initiation and distortion during welding using computational simulation; Development of novel joints based on microstructure formation and strength analysis of welded joints; Development of automation and defect detection technologies combining various sensors and machine learning. | YAMAMOTO, Motomichi                                |
| Materials Engineering for Energy Conversion and Storage | Research and development of energy conversion materials which are in particular related to: Secondary battery materials (Li-Ion and Ni-MH); Fuel cell with non-conventional mechanisms, energy conversion systems (thermochemical hydrogen production and electrolysis of $\text{NH}_3$ and $\text{H}_2\text{O}$ ), and/or solid state hydrogen storage materials; Energy recovery from waste and biomass.                                                                                                                                                                                                                                                       | ICHIKAWA, Takayuki<br>GUO, Fangqin*                |
| Thermal Engineering                                     | Production of hydrogen from biomass using supercritical water; Heat transfer and chemical reactions in supercritical water; Hydrothermal pretreatment of biomass; Chemical heat pump; Structural analysis of nanocrystal; Fundamental research of carbon nanotube.                                                                                                                                                                                                                                                                                                                                                                                               | MATSUMURA, Yukihiko<br>ZHANG, Mengli*              |
| Fluid Engineering                                       | Plasma experiments, developments of plasma control system, and computer simulation for magnetic confinement fusion plasmas; Development of carbon-neutral energy using plasma; Development of new imaging diagnostics for turbulence and its applications; Numerical analysis and measurement to elucidate wall heat transfer mechanism in turbulent flow in pipes, and characteristics of gas-liquid two-phase flows such as liquid jets and fuel sprays for loss reduction technology; Development of new research areas on medical science and engineering using mathematical model and data-driven science                                                   | SUZUKI, Yasuhiro<br>OGATA, Yoichi                  |
| Combustion Engineering                                  | Construction of reaction mechanisms for practical combustion; Improvement of IC engine combustion based on detailed kinetic analysis; Measurements of ignition properties of fuel components and mixtures; Improvement of combustion based on the ignition characteristics of fuels; Low $\text{NO}_x$ , low SPM tubular combustion; Micro combustor; Fire safety.                                                                                                                                                                                                                                                                                               | SHIMOKURI, Daisuke                                 |
| Reactive Gas Dynamics                                   | Fundamental studies on high-speed reactive gas flows such as detonations or explosions; Development of new internal combustion engines or heat sources using high-speed combustion; Fundamental studies on laser ignition; Numerical studies on laser-plasma physics such as laser fusion or laser-plasma x-ray sources; Physics and chemistry of explosions in gas-phase or solid-gas-mixed-phase fluids.                                                                                                                                                                                                                                                       | ENDO, Takuma<br>JOHZAKI, Tomoyuki<br>KIM, Wookyung |
| Plasma Science                                          | Applications of high-density arc plasmas to scientific and engineering fields; Development of plasma window for separation between vacuum and atmosphere; Development of coherent/incoherent bright X-ray sources driven by lasers.                                                                                                                                                                                                                                                                                                                                                                                                                              | NAMBA, Shinichi<br>YAMASAKI, Kotaro                |
| Quantum Energy Applications                             | Monte Carlo simulation on interactions of radiations with matter; Microdosimetry of radiations; Dosimetry of Radiation Hazards; Medical and Engineering Applications of Radiation; Measurement of nuclear reaction cross sections in high and medium energy radiations; Measurement of gamma radiations, alpha and beta particles and environmental radioactivities.                                                                                                                                                                                                                                                                                             | ENDO, Satoru<br>KAJIMOTO, Tsuyoshi                 |

Supervisor below in charge of plural programs takes charge of the program in the following table, including this program.

| Program                                           | Research Fields                                                                            | Academic Staff  |
|---------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------|
| Transdisciplinary Science and Engineering Program | Research and development of hydrogen production, hydrogen storage, and material conversion | MIYAOKA, Hiroki |

Note: The faculty members marked with \* are only in charge of Master's Course.

### Transportation and Environmental Systems Program

| Specialty                                                   | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Academic Staff                                                                             |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Structural Systems                                          | Buckling and ultimate strength evaluations<br>Fracture and fatigue strength evaluations<br>Computational Mechanics, Applied Mechanics, Solid/Structural Analysis<br>Research on a floating structure for offshore wind power generation<br>Energy harvesting using mechanical vibration<br>Nondestructive inspection, Numerical electromagnetic field analysis                                                                                                                                                                            | KATAGIRI, Kazuaki<br>(Concurrent post)                                                     |
| Structural Innovation                                       | Research on novel structures and manufacturing technology and new materials (e.g., CFRP) for aerospace, ships, etc.<br>Advancement of semiconductor device fabrication process<br>Research on the deterioration/failure prediction of infrastructure                                                                                                                                                                                                                                                                                      | KATAGIRI, Kazuaki                                                                          |
| System Safety                                               | Research on safety assessment and maintenance for structures and transportation equipment systems.<br>Development of sensors for dynamic load and deformation measurement.<br>Development of instrumentation system for structural safety management.<br>Automatic control and planning of ship equipments and systems.                                                                                                                                                                                                                   | SHINTAKU, Eiji<br>TANAKA, Yoshikazu                                                        |
| Transportation System Innovation                            | Research on planning and design methodology for transportation systems using ICT<br>Design and planning of new transportation system using maritime logistics big data<br>Development of efficient construction system using factory monitoring<br>Ocean monitoring and observational physical oceanography<br>Data assimilation and ocean environment prediction                                                                                                                                                                         | HAMADA, Kunihiro<br>TANIGUCHI, Naokazu                                                     |
| Marine Transportation System                                | Research on the remote sensing technology for marine environment<br>Research on the sensing technology for maritime transportation<br>Development of an environment friendly marine vehicle<br>Research on prediction of performances of marine vehicle<br>Research on marine navigation safety<br>Research on a new energy transportation                                                                                                                                                                                                | SAKUNO, Yuji<br>SANO, Masaaki<br>Yasukawa, Hironori<br>(Collaborative Research Laboratory) |
| Fluid Dynamics for Transportation and Environmental Systems | Research on the reduction of wind resistance acting on a bridge of ship<br>Research on seakeeping performance of a ship in nonlinear wave<br>Research on aerodynamics of an automobile in the real world<br>Assessment and prediction of ocean-atmosphere environment due to vehicle transportation<br>Research on an advanced technology of electrical energy generated by renewable energy (wind, ocean power, vibration)<br>Research on a technology of energy harvesting<br>Research on CFD technology by using Particle Based Method | MUTSUDA, Hidemi<br>NAKASHIMA, Takuji                                                       |
| Air Transportation and Ocean Systems                        | Research on the aerodynamic properties of WIG flying over the waves<br>Research on the passive control of the wind turbine with elastic composit material<br>Research on the human-powered aircraft<br>Theoretical and experimental researches on Ship seakeeping<br>Ship weather routing with forecast uncertainty<br>Route optimization using NWP models and AI<br>Ship behavior analysis using AIS and environmental data                                                                                                              | IWASHITA, Hidetsugu<br>CHEN, Chen                                                          |
| Geophysical Fluid System                                    | A study of influence of the Kuroshio on the state and variability of the Seto Inland Sea.<br>A study of tidal mixing and tidal front.<br>A study of the turbulent processes from planetary scale to microscale in an ocean.<br>A study of the spontaneous transition between two states in a geophysical flow.                                                                                                                                                                                                                            | ARAI, Masazumi*                                                                            |

Note: The faculty members marked with \* are only in charge of Master's Course.

## Architecture Program

### (Building Engineering Field)

| Specialty                             | Research Fields                                                                                                                                                                                                                                                                                          | Academic Staff  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Building Materials and Components     | Study on large-scale wooden construction using wooden materials including CLT<br>Research on development of wooden semi-rigid frame structure<br>Evaluating method of residual seismic performance of existing wooden construction<br>Long term performance evaluation of wooden buildings and materials | MORI, Takuro    |
| Structural Mechanics of Building      | Research on structural system preventing deformation concentration<br>Study on low damage building structure against severe earthquake<br>Performance evaluation and design of vibration-controlled structures<br>Method for evaluating and enhancing seismic resilience of buildings                    | CHEN, Xingchen  |
| Building Structures                   | Seismic design of steel structures<br>Vibration control system of steel structures<br>Beam-to-column connections and column-bases of steel structures<br>Buckling analysis and design of steel frames<br>Seismic retrofit of existing structures                                                         | TAGAWA, Hiroshi |
| Disaster Prevention Engineering       | Earthquake strong motion prediction technology<br>Ground motion evaluation<br>Building damage estimation for scenario earthquakes<br>Remote sensing for disaster response<br>Spatial data analysis for disaster risk evaluation                                                                          | MIURA, Hiroyuki |
| Earthquake and Structural Engineering | Seismic response evaluation of reinforced concrete buildings<br>Seismic retrofit method of existing concrete buildings<br>Post-earthquake residual capacity evaluation of reinforced concrete buildings<br>Seismic performance evaluation of buildings with brick masonry walls                          | SUZUKI, Tomomi  |

### (Architecture Field)

| Specialty                               | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                      | Academic Staff                                                                 |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Urban and Architectural Planning        | Urban environmental planning (green, wind, water, climate, hazard, energy, and built environment).<br>Compact city design with population decrease.<br>Sustainable community design with using GIS.<br>Housings in urban and local area.<br>The planning of social welfare and community facilities.<br>The region-based housing supply system.<br>The planning and the management of building production processes. | TANAKA, Takahiro<br>SUMIKURA, Hideaki<br>ISHIGAKI, Aya                         |
| Architectural History and Design Theory | Theory on peace architecture and urban design.<br>Theory on environment and landscape design.<br>History of modern architecture and modern urbanism in Japan and World.<br>Research and planning for the conservation of buildings and towns.                                                                                                                                                                        | MIZUTA, Susumu                                                                 |
| Architectural Environment               | Problems concerning with human behavior and/or environmental psychology in architectural and urban field<br>Psychological evaluation of regional landscape and living environment<br>Energy conservation of buildings<br>Efficient use of renewable energy                                                                                                                                                           | NISHINA, Daisaku<br>(Retirement at the end of March 2026)<br>KINDAICHI, Sayaka |
| Architectural Project                   | Design of an environmentally conscious architecture<br>Architectural design using BIM and CFD analysis<br>Design of temporary shelters immediately after the disaster<br>Study on wooden buildings using domestic solid wood                                                                                                                                                                                         | NAKAZONO, Tetsuya                                                              |

Supervisor below in charge of plural programs takes charge of the program in the following table, including Architecture Field of this program.

| Program                                           | Research Fields                                                                                     | Academic Staff |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------|
| Transdisciplinary Science and Engineering Program | Building and urban environmental science for achieving sustainable development in developing world. | KUBOTA, Tetsu  |

Note: The faculty members marked with \* are only in charge of Master's Course.

### Civil and Environmental Engineering Program

| Specialty                                    | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Academic Staff                                          |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Structural Materials and Concrete Structures | Education and research on the physicochemical characteristics of cementitious materials, the mechanical and durability performance evaluation of plain, reinforced and prestressed concretes, effective utilization of resources, environmental impact evaluation of concrete, and maintenance of concrete structures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | KAWAI, Kenji<br>OGAWA, Yuko                             |
| Structural Engineering                       | Education and research on evaluation of structural performance and durability of concrete structures, strength development and deterioration of cement-treated soils, and cementitious engineered barrier for nuclear waste management.<br>Education and research on mathematical structural design and structural optimization by FEM etc., bifurcation buckling of structures, dynamics problems and fluid-structure interaction problems, and multiple folding stability problems such as bridges, bridge damage survey analysis and development due to natural disasters.                                                                                                                                                                                                                                           | NAKARAI, Kenichiro<br>ARIO, Ichiro*<br>NGUYEN, Huu May* |
| Geotechnical Engineering                     | Evaluation of mechanical property of soft ground, Ground improvement techniques, Engineering properties of cement treated clay and recycled geo-materials, Development of new construction technology for waste disposal facility in coastal areas, In-situ testing of weathered granite soil and the application on disaster prevention of natural slopes in heavy rainfall, Estimation and countermeasures of sand liquefaction by earthquakes, Evaluation of seismic site response of ground, Earthquake resistant design of geotechnical works, Maintenance and condition evaluation method for road pavement and geotechnical structures, Conservation of historic structures based on geotechnical engineering, Clarification and modeling of multiscale behavior of geomaterials and soil-structure interaction. | HATA, Toshiro<br>KIDO, Ryunosuke                        |
| Infrastructure Management                    | Structural analysis and simulation, damage identification and deterioration diagnosis of infrastructures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | KHAJI, Naser                                            |
| Global Environment and Planning              | Development of planning methodology, and analysis for following themes; recycling and low-carbon society, urban transportation system by making full use of an economical evaluation, a statistical model, and a mathematical planning, a travel behavior model, or network science. Researches on material flows for scarce metals, market share forecast on low emission vehicles, development of statistical model for "big-data", on consensus building by statistical approach for text data                                                                                                                                                                                                                                                                                                                       | TSUKAI, Makoto<br>FUSE, Masaaki                         |
| Environmental Preservation Engineering       | Biological wastewater treatment.<br>Energy recovery from biomass by microbes.<br>Nitrogen and Phosphorous removal.<br>Microbial community analysis.<br>Analysis and modelling of behavior of trace toxic chemicals in air and water environments.<br>Application of membrane filtration technique on wastewater treatment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | KINDAICHI, Tomonori                                     |
| Hydraulic Engineering                        | Flood forecast; interactions among flood flow, vegetation and morphology in rivers; multi-scale phenomena of flow and sediment transport in a dynamic fluvial system; sedimentation sorting and variation in porosity and sediment volume in rivers; tsunami dynamics in rivers; multi-phase flows with sediment transport around river structures; sediment-flood inundation and sediment capacity in rivers                                                                                                                                                                                                                                                                                                                                                                                                           | UCHIDA, Tatsuhiko<br>INOUE, Takuya                      |
| Coastal Engineering                          | Development of technology to improve environment in river bank<br>Practical use of "sediment microbial fuel cells" more than solar batteries<br>Research on groundwater and tidal flat environment in tidal estuaries                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | HIBINO, Tadashi                                         |

Supervisor below in charge of plural programs takes charge of the program in the following table, including this program.

| Program                                           | Research Fields                                                                                                                                                                                                             | Academic Staff      |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Transdisciplinary Science and Engineering Program | Transportation planning methods, evaluation of transport policies, and sustainable development and transport                                                                                                                | FUJIWARA, Akimasa   |
|                                                   | Smart urban infrastructure, transportation planning, urban planning, travel behavior analysis, travel survey design, transport network analysis, resilience research, risk analysis                                         | CHIKARAISHI, Makoto |
|                                                   | Renewable energy evaluation and management in developing countries, Numerical models for coastal hazards・disaster prevention・mitigation, Evaluation of climate changes on natural hazards and renewable energy environment. | LEE, Han Soo        |

# Informatics and Data Science Program

| Specialty                            | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Academic Staff                                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Computer Systems                     | Research on novel computer architectures, systems, and computing techniques for machine learning and combinatorial optimization. In particular, we use GPUs, FPGAs, and quantum computers for accelerating machine learning and for solving combinatorial optimization problems.                                                                                                                                                                                                        | NAKANO, Koji<br>PARQUE, Victor                                 |
| Intelligent Systems                  | Machine learning, High-performance computing, Parallel and distributed computing, Quantum computing, Embedded system                                                                                                                                                                                                                                                                                                                                                                    | ITO, Yasuaki                                                   |
| Visual Information Science           | Computer graphics, visualization, image processing, image recognition and understanding, computer vision, machine learning, deep learning, brain-inspired computing and various applications of these technologies, such as biomedical imaging and image analysis, optical design, vision and language-based information fusion (computer vision and natural language processing), autonomous driving, video surveillance and human-computer interaction.                               | RAYTCHEV, Bisser<br>HIGAKI, Toru<br>GU, Yanlei                 |
| Learning Engineering                 | Research on technology-enhanced learning systems designed based on knowledge modeling, implemented with artificial intelligence, multimedia and web technologies, and then practiced from viewpoint of education and psychology.                                                                                                                                                                                                                                                        | HIRASHIMA, Tsukasa<br>HAYASHI, Yuusuke<br>DAI, Yiling*         |
| Foundation of Computer Science       | Cryptography and information security. In particular, privacy-enhancing authentications and network services, and implementations based on elliptic curve cryptosystems.<br>Mobile and ubiquitous computing. In particular, communication, activity recognition, and location sensing using wireless devices.<br>AI security and privacy. In particular, privacy-preserving machine learning, detection and defense against poisoning attacks, and methods for protecting data privacy. | NAKANISHI, Toru<br>KITASUKA, Teruaki<br>LIAN, Zhuotao*         |
| Dependable Systems                   | Reliability and Maintenance, Dependable computing, Fault tolerant computing, Computer security, Performance evaluation, Operations research, Software reliability engineering, Formal engineering methods for software development, Software testing and formal verification, Intelligent software engineering environment                                                                                                                                                              | DOHI, Tadashi<br>OKAMURA, Hiroyuki<br>ZHENG, Junjun            |
| Distributed Systems                  | Theory and practice on parallel and distributed systems, such as secure and efficient resource sharing schemes, real-time file exploration in wide area networks, high-performance computing using PC clusters, contents delivery in service providing networks, and environment monitoring systems based on wireless sensor networks.                                                                                                                                                  | FUJITA, Satoshi                                                |
| Data Analytics and Modeling          | Statistical machine learning (including Bayesian modeling and deep learning) and its applications to large-scale, complex and/or dynamic data analysis and generation (especially focusing on natural languages, networks, financial data, brain data, and multimodal data).                                                                                                                                                                                                            | EGUCHI, Koji<br>ANDRADE, Daniel<br>FUKUSHIMA, Makoto<br>YU, Yi |
| Advanced Network                     | Research on the technologies of the Internet architecture, network applications, decentralized computing, and information security, especially including mobility technology, virtualization / cloud infrastructure technology, IoT, operation management, distributed ledger technology, digital identity management, access control, formal methods, and distributed deep learning.                                                                                                   | KONDO, Tohru<br>DING, Yepeng*                                  |
| Information Security                 | Research on the application of information security technologies to network systems and computer systems, the construction of management system and its operation to maintain information security, and the education for administrators and users to operate and use them properly.                                                                                                                                                                                                    | NISHIMURA, Kouji                                               |
| Informatics and Mathematical Science | System theory and intelligent information processing, Stabilization and optimization for stochastic systems, Numerical analysis and optimal design for mechatronic systems.<br>Stochastic processes, especially going around fractals. Spectral analysis of the generators associated with the stochastic processes on fractals.                                                                                                                                                        | MUKAIDANI, Hiroaki<br>SHIMA, Tadashi                           |
| Pattern Recognition                  | Development of pattern recognition and machine learning algorithms for image understanding, image synthesis, 3D understanding, etc.                                                                                                                                                                                                                                                                                                                                                     | AIZAWA, Hiroaki*                                               |
| Social Computing                     | Algorithm for processing and utilizing "big data". Data mining for SNS, Web, IoT, GPS, etc. Recommendation System, Personalization, Database marketing, Privacy-preserving information retrieval, Parallel and Distributed Algorithms, etc.                                                                                                                                                                                                                                             | MORIMOTO, Yasuhiko<br>KAMEI, Sayaka<br>LOU, Yang               |
| Learning Analytics                   | Statistical growth model, Information system supporting education and learning                                                                                                                                                                                                                                                                                                                                                                                                          | SUMIYA, Takahiro                                               |
| Computational Complexity Theory      | Computational complexity theory, hierarchies of complexity classes, combinatorial computational geometry, visibility problems and art gallery theorems, design and analysis of algorithms.                                                                                                                                                                                                                                                                                              | IWAMOTO, Chuzo                                                 |

Note: The faculty members marked with \* are only in charge of Master's Course.

| Specialty                          | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Academic Staff                   |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Intelligent Control Systems        | We conduct research on intelligent control systems for realizing a super-smart society (Society 5.0), especially fundamental and theoretical research on machine learning, optimal control, multi-agent systems, cyber-physical systems, etc., as well as practical applications to practical systems such as power management, big data for medical care, smart mobility, etc.                                                                                                            | NAGAHARA, Masaaki<br>LI, Mengmou |
| Financial Data Science             | We combine various models and techniques of quantitative finance with machine learning for achieving superior investment returns while taming the risk.<br>We apply the state-space model and other methods to analyze financial time series.<br>We also look into different correlation structures and perform feature importance analysis, examine optimal clustering, construct novel portfolios, estimate financial risk exposures, and propose new investment and trading strategies. | TING, Hian Ann                   |
| Complex Systems Science            | Modelling, analysis, and control of complex systems including swarm systems, natural phenomena, cyber-physical systems, and social networks using the tools from machine learning, control theory, optimization, and self-organization.                                                                                                                                                                                                                                                    | OGURA, Masaki                    |
| Bayesian Statistics and Inference  | Research on Bayesian inference, with focus on hypothesis testing procedures. Also, research on item response theory models for data from educational or psychological backgrounds.                                                                                                                                                                                                                                                                                                         | TENDEIRO, Jorge                  |
| Multivariate Analysis and Modeling | Theoretical and Applicational study of Multivariate Data Analysis. Research related to Psychometrics, Biostatistics and Medical Statistics.                                                                                                                                                                                                                                                                                                                                                | MONDEN, Rei                      |
| Intelligent Biosignal Informatics  | Research on the measurement, analysis, and modeling of human biosignal information and its machine learning applications. Topics include biosignal processing for EMG, EEG, ECG etc., probabilistic modeling, machine learning, deep learning, human-machine interface, robotic prostheses, biomedical image analysis, motion analysis, etc.                                                                                                                                               | FURUI, Akira                     |
| Survival Analysis                  | We develop new statistical methods for survival analysis. In particular, we use copulas for modeling multivariate survival data.                                                                                                                                                                                                                                                                                                                                                           | EMURA, Takeshi                   |
| Applied Computational Science      | Research on computational science, numerical modeling, and optimal design. In particular, we focus on developing and analyzing numerical methods for wave phenomena such as acoustic, elastic, and electromagnetic waves, as well as on applying optimal design theory to the creation of novel materials and structures.                                                                                                                                                                  | MATSUSHIMA, Kei                  |

Supervisor below in charge of plural programs takes charge of the program in the following table, including this program.

| Graduate School / Program                                                                               | Research Fields                                                                                                                | Academic Staff                                          |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Graduate School of Advanced Science and Engineering / Transdisciplinary Science and Engineering Program | Research on Media Communication Services                                                                                       | KODAMA, Mei                                             |
|                                                                                                         | Cybersecurity, Confidential Computing                                                                                          | WATANABE, Hidenobu                                      |
|                                                                                                         | Studies on information system and information security education                                                               | IWASAWA, Kazuo<br>(Retirement at the end of March 2026) |
| Graduate School of Humanities and Social Sciences / Economics Program                                   | Econometrics (Time series econometrics, Spatial econometrics), Signal Processing on Graphs                                     | YAMADA, Hiroshi                                         |
| Graduate School of Humanities and Social Sciences / Psychology Program                                  | Social psychological research on human behavior. Especially, research on inter-personal communication using indirect meanings. | HIRAKAWA, Makoto                                        |

## Smart Innovation Program

### (Applied Chemistry)

| Specialty                                 | Research Fields                                                                                                                                                                                                            | Academic Staff                            |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Element-Based Organic Materials Chemistry | Education and research on element-based materials, in particular synthesis and applications of polymers with inorganic elements, and development of functional materials with epoch-making optoelectronic characteristics. | OHSHITA, Joji<br>ADACHI, Yohei            |
| Computational Materials Science           | Education and research on computational chemistry, in particular understanding of chemical and physical phenomena based on molecular simulation and applications using data science.                                       | ISHIMOTO, Takayoshi<br>KANEMATSU, Yusuke* |

Supervisor below in charge of plural programs takes charge of the program in the following table, including this program.

| Program                   | Specialty                                     | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                               | Academic Staff                                                             |
|---------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Applied Chemistry Program | Organic Supramolecular Chemistry              | Education and research on development of synthetic reactions and supramolecular complexes applied for creating functional organic molecules in everyday life, medicinal field, and high technology.                                                                                                                                                                                                                           | IKEDA, Atsushi<br>KAWASAKI, Riku                                           |
|                           | Polymer Chemistry                             | Education and research on polymer chemistry, especially, precision polymerization catalyzed by transition metal complex and development of new polymers from renewable biomass.                                                                                                                                                                                                                                               | OSAKA, Itaru<br>(Concurrent post)<br>NAKAYAMA, Yuushou<br>TANAKA, Ryo      |
|                           | Organic $\pi$ -Conjugated Materials Chemistry | Education and research on novel organic functional and semiconducting materials such as $\pi$ -conjugated polymers, and their application to energy and/or electronic devices such as organic solar cells. Education and research on novel organic synthetic methodology by developing new reactions, reagents, and catalyst, and their application to syntheses of various organic functional materials and pharmaceuticals. | OSAKA, Itaru<br>MIKIE, Tsubasa*                                            |
|                           | Functional Dye Chemistry                      | Development of novel functional dye and polymer materials with epoch-making optoelectronic characteristics, fluorescence sensing ability and therapeutic activity. Education and research on new functions of organic/inorganic materials and their applications to novel electronic/optoelectronic devices                                                                                                                   | OYAMA, Yousuke<br>IMAE, Ichiro<br>IMATO, Keiichi<br>KOMAGUCHI, Kenji       |
|                           | Inorganic and Hybrid Materials Chemistry      | Research and education on ceramics, with main interests on molecular design, synthesis, characterization, and applications of new inorganic or inorganic-organic hybrid materials having functional nano-structures.                                                                                                                                                                                                          | INUMARU, Kei<br>KATAGIRI, Kiyofumi<br>TARUTANI, Naoki<br>FUKUOKA, Hiroshi* |
|                           | Catalytic Materials Chemistry                 | Synthesis and characterization of novel functional metal oxide materials such as metal oxide clusters, zeolites, and related materials, and their application to catalysts and adsorbents in environmental and energy research fields.                                                                                                                                                                                        | SADAKANE, Masahiro<br>MINATO, Takuo*                                       |

Note: The faculty members marked with \* are only in charge of Master's Course.

(Electrical, Systems, and Control Engineering)

| Specialty                   | Research Fields                                                                                                                                                                                                                                                                                                 | Academic Staff                                                               |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Control Systems Engineering | Research and education on system control technology and digital signal processing. Specifically, adaptive & learning control system technology for industrial systems, Cyber-Physical Systems(CPS), Model Based Development (MBD) and digital signal processing for communication systems and image processing. | YAMAMOTO, Toru<br>WAKITANI, Shin<br>KINOSHITA, Takuya<br>NAKAMOTO, Masayoshi |
| Smart Robotics              | Research on hyper-human robotics technology exceeding man's capability, and its real world applications. For example, high-speed robot vision, robot mechanism design, mobile robot, sensor-based manipulation, multimedia applications, industrial applications, medical applications, bio-applications, etc.  | ISHII, Idaku<br>TAKAKI, Takeshi<br>AMBE, Yuichi<br>SHIMASAKI, Kohei*         |

Supervisor below in charge of plural programs takes charge of the program in the following table, including this program.

| Program                                              | Specialty                        | Research Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Academic Staff                                                                                                  |
|------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Electrical, Systems, and Control Engineering Program | Social Informatics               | Research and simulation analysis on the fundamental technologies of artificial adaptive agent models.<br>Analytical studies based on game theory regarding equilibrium and consensus among decision-makers such as individuals and organizations, and development of decision-making methods.<br>Optimization of social systems (electric power systems) using optimization techniques such as mathematical optimization and evolutionary computation to design optimal next-generation social systems.                                                           | HAYASHIDA, Tomohiro<br>SEKIZAKI, Shinya                                                                         |
|                                                      | Production Systems Engineering   | Research on design, planning and control techniques of large-scale, complicated manufacturing systems and supply chains. Some research topics are the utilization of human capability as a fundamental element of the production system, the development of manufacturing systems which adapt to the change of manufacturing environment, the application of optimization and simulation techniques for planning facility, production-distribution-inventory systems, and service systems, and the development of scheduling techniques.                          | MORIKAWA, Katsumi                                                                                               |
|                                                      | Mathematics                      | Research on inverse problems of differential equations. Mathematical analysis of linear PDEs.<br>Dynamical systems and ergodic theory.<br>Research on nonlinear elliptic and parabolic differential equations, and applications to the dynamical system and phenomenological theory.<br>Statistical physics of neural networks.                                                                                                                                                                                                                                   | TSUGE, Naoki<br>YOSHIKAWA, Shuji<br>KAWASHITA, Wakako<br>YONG, Moo Chung<br>WAKASUGI, Yuta<br>UCHIYAMA, Satoki* |
|                                                      | Electric Power and Energy System | Research on large-scale, complex and nonlinear electric power systems, including problems of operation, planning, stability analysis, and control. Recent topics include the construction of smart microgrid using new type of converter under development (hardware) and its control technologies (software). Keywords: renewable energy, distributed power generation, battery, vehicle-to-grid, optimization technique, artificial intelligence (AI) application, control system design, analysis technology, reliable ICT application, algorithm development. | ZOKA, Yoshifumi<br>SASAKI, Yutaka<br>TAOKA, Satoshi                                                             |
|                                                      | Biological Systems Engineering   | Research on the measurement, analysis, and modeling of biological functions, as well as their engineering applications. Our goal is to expand human potential and contribute to a more vibrant society through a deeper understanding of sensory, motor, and brain functions. Key areas of focus include biomedical signal processing, human-machine systems, haptics, virtual reality, human interaction, medical engineering, human augmentation, and brain-tech systems.                                                                                       | KURITA, Yuichi<br>SOH, Zu<br>TAKEMI, Mitsuaki                                                                   |
|                                                      | Applications of Cybernetics      | Research on the modeling and application of a complicated phenomenon. For example, measurement and diagnosis for the living body information and system integration, engineering application, etc.                                                                                                                                                                                                                                                                                                                                                                | KOMINE, Hidehiko<br>MIYATA, Natsuki                                                                             |

## Quantum Matter Program

### Physics Field

| Specialty                            | Research Fields                                                                                                                                                                                                                                                                                                                                     | Academic Staff       |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Electron Theory of Solids            | Mechanism of anisotropic superconductivity and interplay between magnetism and superconductivity in strongly correlated electron systems and quasi - lowdimensional systems. Superconductivity in high magnetic fields including the Fulde-Ferrell-Larkin-Ovchinnikov state. Magnetism in low and quasi-low dimensional systems.                    | SHIMAHARA, Hiroshi   |
|                                      | Theoretical studies on the 3d and 4f electrons and high-energy spectroscopies in transition-metal and rare-earth compounds.                                                                                                                                                                                                                         | TANAKA, Arata        |
| Computational Physics                | Development of the energy band theory beyond the density functional theory and its application to solids.                                                                                                                                                                                                                                           | HIGUCHI, Katsuhiko   |
|                                      | Condensed matter theory and statistical physics. Theoretical studies on topological systems, Dirac semimetals, superconductivity, and magnetism including spin liquids.                                                                                                                                                                             | TADA, Yasuhiro       |
| Strongly Correlated Electron Physics | Experimental study on ordered structures and fluctuations of charge, spin, orbital, and higher multipole moments in strongly correlated electron systems by means of neutron and resonant x-ray scatterings. Also, by studying thermal and transport properties, we aim at total understanding from microscopic and macroscopic points of view.     | MATSUMURA, Takeshi   |
|                                      | Experimental study on cross-correlation phenomena in quantum materials with broken symmetry. We aim to elucidate the origin of cross-correlation phenomena by measuring fundamental physical properties under multiple extreme conditions of electric field, magnetic field, and pressure.                                                          | AOYAMA, Takuya       |
| Magnetism                            | Experimental research on magnetic property of rare-earth compounds and thermal property of clathrate compounds. Macroscopic measurements and neutron scattering experiments are performed to reveal origins of new phenomena.                                                                                                                       | ONIMARU, Takahiro    |
|                                      | Single crystal growth of new rare-earth compounds and measurements for magnetic/thermal properties at very-low temperature mainly below 1 K, to find exotic phase transition and anomalous metallic state.                                                                                                                                          | SHIMURA, Yasuyuki    |
| Low Temperature Physics              | Exploration of novel materials such as superconductors and quantum magnets consisting of transition metal elements with strong electron correlations and heavy elements with strong relativistic effects, and search for exotic quantum states.                                                                                                     | NOHARA, Minoru       |
|                                      | Experimental investigation of nano-scale physics. Quantum coherence, single electron phenomena and non-equilibrium transport are studied by fabricating extremely small structures and measuring low-temperature transport.                                                                                                                         | YAGI, Ryuta          |
|                                      | Experimental studies on the strongly correlated electron systems by means of ultrasonic spectroscopy. Our research focuses on novel physical properties originating from magnetism, multipoles, and structural chirality under multiple extreme conditions.                                                                                         | ISHII, Isao          |
| High Energy Physics                  | High Energy Physics and its application:<br>Physics of Tera-scale by high energy electron-positron collider<br>R&D of intense photon sources by the Laser-Compton scattering<br>Experimental study of Light-by-Light scattering                                                                                                                     | TAKAHASHI, Tohru     |
|                                      | Experimental studies on quantum optics and its application; applications to quantum information science, fundamental physics, and bioengineering by quantum optical methods and techniques.                                                                                                                                                         | IINUMA, Masataka*    |
| Beam Physics                         | Study of charged-particle beams and non-neutral plasmas.                                                                                                                                                                                                                                                                                            | OKAMOTO, Hiromi      |
|                                      | Experimental research on trapped charged particles and related physics. Production of low energy particle beams and their application for atomic physics, plasma physics, and beam physics research.                                                                                                                                                | HIGAKI, Hiroyuki     |
|                                      | Experimental study on collective motions in charged particle systems. Application of non-neutral plasma systems to beam physics. Production of nano-ion beam sources.                                                                                                                                                                               | ITO, Kiyokazu*       |
| Accelerator Physics                  | Theoretical and experimental study for beam dynamics. Research and development of high energy accelerator and its applications for light source, Xray source. Research for high brightness (polarized) electron and (polarized) positron sources and study for photo-cathode and laser as key technologies of the high brightness particle sources. | KURIKI, Masao        |
|                                      | Theoretical and experimental study of accelerator dynamics and applications. Beam improvement and background reduction in colliders. R&D for future accelerators. Development of polarized electron sources.                                                                                                                                        | LIPTAK, Zachary John |

Note: The faculty members marked with \* are only in charge of Master's Course.

| Specialty          | Research Fields                                                                                                                                                                                                                                                                                                                                                                       | Academic Staff |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Quantum Properties | Studies of the thermal, transport and magnetic properties of rare-earth and transition-metal compounds under high pressures. Main research subjects are pressure-induced quantum critical phenomena of heavy-fermion systems, anomalous magnetism in geometrically frustrated systems under pressure, and pressure dependence of the quasi-localized vibrational modes in clathrates. | UME0, Kazunori |

Supervisor below in charge of plural programs takes charge of the program in the following table, including Physics Field of this program.

| Program                                           | Research Fields                                                                                                                                            | Academic Staff     |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Transdisciplinary Science and Engineering Program | Condensed matter physics under multiple extreme conditions (very high pressure, ultra-low temperature, strong magnetic field) by laser spectroscopy method | OGITA, Norio       |
|                                                   | Condensed Matter Theory on Superconductivity and Superfluidity                                                                                             | HIGASHITANI, Seiji |
|                                                   | Lattice dynamics in condensed matter investigated by inelastic scattering of Quantum beam and first-principles calculation                                 | HASEGAWA, Takumi   |
|                                                   | Experimental-nanoscale physics on superconductors and related materials with scanning probe microscopy/spectroscopy                                        | SUGIMOTO, Akira    |

## Electronic Engineering Field

| Specialty                           | Research Fields                                                                                                                                                                                                                                                                                                                                                             | Academic Staff      |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Mesoscopic Physics Theory           | Theory of quantum electron transport in mesoscopic systems and lowdimensional electron systems.                                                                                                                                                                                                                                                                             | TAKANE, Yositake    |
|                                     | Theoretical study of resonant optical response produced by surface plasmons in metallic nano-structures, and development of fast electromagnetic simulation softwares.                                                                                                                                                                                                      | NISHIDA, Munehiro   |
| Semiconductor Quantum Optics        | Development of the devices for generation and detection of terahertz waves using ultrafast pulse lasers, and the devices for lightwave control using artificial material (meta-material).                                                                                                                                                                                   | KADOYA, Yutaka      |
|                                     | Theoretical research on quantum optics and quantum information; quantum computation and communication using highly non-classical states of light                                                                                                                                                                                                                            | Holger F. HOFMANN   |
|                                     | Crystal growth of semiconductor thin films and quantum structures, investigation of their optical characteristics, and development of novel optical devices.                                                                                                                                                                                                                | TOMINAGA, Yoriko    |
| Material Science of Nanotechnology  | Experimental study of the mechanisms of self-assembled/self-organized structures consisting of organic molecules with scanning probe microscopes and their application for nanotechnology. Development of new analysis methods of organic molecules and/or bio-molecules and new application techniques of bio-molecules (motor protein, etc.) using micro/nano structures. | SUZUKI, Hitoshi     |
|                                     | Experimental studies on the fabrication of the surfaces and films with new properties by using 2- or 3-dimensional self-assembled integration of molecules and nanoparticles.                                                                                                                                                                                               | SAKAUE, Hiroyuki*   |
| Semiconductor Electronics           | Research on novel thin-film semiconductor processing techniques such as crystalline growth, low-temperature deposition of insulator films, and junction formation and their application to large-area electronics (solar cells, flat panel displays, etc) and ULSI devices.                                                                                                 | HIGASHI, Seichiro   |
|                                     | Development of new thin-film structure formation technology and research of its application to quantum-effect devices.                                                                                                                                                                                                                                                      | HANAFUSA, Hiroaki   |
| Integrated Devices                  | RF/microwave/millimeter-wave CMOS circuit design. Circuit theory. Microwave and millimeter-wave measurement. Device characterization and modeling.                                                                                                                                                                                                                          | AMAKAWA, Shuhei     |
|                                     | Research on Electronic Design Automation (EDA) techniques for large-scale digital VLSI systems, with a particular focus on physical design of integrated devices in advanced semiconductor fabrication technologies. In addition, research on cell library design to achieve robust and low-voltage operation of digital VLSI systems.                                      | NISHIZAWA, Shinichi |
| Integrated Systems                  | Research on system architecture, circuit design, layout optimization, active/passive device modeling and measurement for ultrahigh-frequency millimeter-wave and terahertz wireless communication and sensors with nanometer CMOS integrated circuits.                                                                                                                      | FUJISHIMA, Minoru   |
|                                     | Analysis, synthesis and design of architecture and RF circuit in CMOS technology. High-speed transceivers for wireless and wired communications between LSI chips. Development of design method combining communication, mount and circuit technique.                                                                                                                       | SASAKI, Mamoru      |
|                                     | Research on CMOS integrated circuit design that enables the coexistence of conflicting characteristics, such as low power and high-speed operation for wireline communication systems, and low-noise, low-voltage operation for signal detectors used in sensing and imaging. In addition, the creation of novel devices and systems through heterogeneous chip stacking.   | KUBOKI, Takeshi     |
| Integrated Circuits                 | Low-power and low-noise circuit techniques for analog-digital merged system LSIs. Architecture and circuit technologies for Bio-Sensor LSI, which realize sensing a neural signal.                                                                                                                                                                                          | YOSHIDA, Takeshi    |
| Nanodevice Engineering              | Silicon-Carbide (SiC) harsh-environment electronics for space exploration, decommissioning of nuclear power stations and medical, SiC power semiconductor devices and silicon thin-film devices.                                                                                                                                                                            | KUROKI, Shin-Ichiro |
| Nano-photon and quantum Engineering | Research on novel quantum physics in photon, spin and electrons as well as frontier device physics enabling low latency and low power consumption to realize next generation LSI enabling ultra-efficient information processing.                                                                                                                                           | GOTOH, Hideki       |
| Nanoprocess Engineering             | Research on devise structures, advanced process technology, and evaluation system for advanced LSI, and research on new devise structures, process technology of wide bandgap semiconductor (GaN) for power devices and high-speed communication.                                                                                                                           | TERAMOTO, Akinobu   |
|                                     | Research on low-power consumption devices and thermoelectric devices using group IV semiconductors as well as evaluation of their physical properties and processes for realization of next-generation LSI and the Internet of Things (IoT) society.                                                                                                                        | YOKOGAWA, Ryo*      |

Note: The faculty members marked with \* are only in charge of Master's Course.

| Specialty                                   | Research Fields                                                                                                                                                                                                                                                                                 | Academic Staff    |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Intelligent Integrated Circuits Engineering | Research on wireless communication networks, wireless signal processing, wireless communication architecture & intelligent integrated circuits, and radio-wave propagation for wireless-environment cognitive IoT integrated system considering disaster resistance and medical applications.   | KAMEDA, Suguru    |
|                                             | Architecture and circuit technologies for LSI, which realize real-time recognition systems for flexible and intelligent information-processing based on reconfigurable logic-in-memory architecture approaches, and the systems development of medical / agricultural engineering applications. | KOIDE, Tetsushi   |
|                                             | Research on wireless communication networks, wireless signal processing, wireless communication architecture, and radio-wave propagation considering disaster resistance and space applications.                                                                                                | MIYAKE, Masataka  |
|                                             | Wireless sensing and biomedical imaging by using microwave and millimeter wave towards medical application, development of integrated sensing and communication (ISAC) system and the application for network management, fusion of optical and radio wave for biomedical measurement.          | SONG, Hang        |
| Biomagnetics                                | Research on optical and magnetic properties of biogenic crystals and living cells in tissue engineering. Electromagnetic manipulation of biological materials in bio-MEMS for biomedical science and biotechnology.                                                                             | IWASAKA, Masakazu |

Note: The faculty members marked with \* are only in charge of Master's Course.

**Transdisciplinary Science and Engineering Program (Environmental and Natural Sciences Field)**

| Specialty                                           | Research Fields                                                                                                                                            | Academic Staff                                          |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Environmental Earth Sciences                        | Hydrologic transport of earth surface materials: hydrogeomorphology and biogeochemistry                                                                    | ONODERA, Shin-ichi                                      |
|                                                     | Reaction and transport relevant to rock weathering                                                                                                         | YOKOYAMA, Tadashi                                       |
|                                                     | Thermodynamics of the global climate and fluid systems, dissipative structures of non-equilibrium systems                                                  | OZAWA, Hisashi                                          |
|                                                     | Environment-geology-ecosystem interactions in terrestrial to coastal waters                                                                                | SAITO, Mitsuyo                                          |
|                                                     | Nutrient cycling and water security in watersheds                                                                                                          | ISHIDA, Takuya                                          |
| Physics of Complex Matter                           | Static and dynamic structures and physical properties of structurally disordered matter                                                                    | INUI, Masanori<br>(Retirement at the end of March 2026) |
|                                                     | Crystal growth and pattern formation of softmatter                                                                                                         | TAGUCHI, Ken                                            |
|                                                     | Physics of complex systems, such as active matter and non-equilibrium ordering                                                                             | TANAKA, Shinpei                                         |
|                                                     | Physics Education Research, Molecular Dynamics Simulation of Liquids                                                                                       | MUNEJIRI, Shuji                                         |
| Physics of Correlated Matter                        | Physics of Disordered Materials (liquids and glasses)                                                                                                      | KAJIHARA, Yukio                                         |
|                                                     | Quantum information theory concerning e.g. quantum entanglement and quantum communication                                                                  | ISHIZAKA, Satoshi                                       |
|                                                     | Condensed matter physics under multiple extreme conditions (very high pressure, ultra-low temperature, strong magnetic field) by laser spectroscopy method | OGITA, Norio                                            |
|                                                     | Condensed Matter Theory on Superconductivity and Superfluidity                                                                                             | HIGASHITANI, Seiji                                      |
|                                                     | Lattice dynamics in condensed matter investigated by inelastic scattering of Quantum beam and first-principles calculation                                 | HASEGAWA, Takumi                                        |
|                                                     | Experimental-nanoscale physics on superconductors and related materials with scanning probe microscopy/spectroscopy                                        | SUGIMOTO, Akira                                         |
| Information and Media Sciences                      | Circuit quantum gravity theory concerning e.g. circuit analogue black holes                                                                                | KATAYAMA, Haruna*                                       |
|                                                     | Computational approach to strong coupling and gravitational systems, Computer based learning materials                                                     | INAGAKI, Tomohiro                                       |
|                                                     | Research on Media Communication Services                                                                                                                   | KODAMA, Mei                                             |
|                                                     | Cybersecurity, Confidential Computing                                                                                                                      | WATANABE, Hidenobu                                      |
|                                                     | Information Education, Theoretical Particle Physics, Large-Scale Numerical Simulations                                                                     | MURAKAMI, Yuko                                          |
| Materials Science for Energy Conversion and Storage | Studies on information system and information security education                                                                                           | IWASAWA, Kazuo<br>(Retirement at the end of March 2026) |
|                                                     | Research and development of hydrogen production, hydrogen storage, and material conversion                                                                 | MIYAOKA, Hiroki                                         |

Supervisor below in charge of plural programs takes charge of the program in the following table, including Environmental and Natural Sciences Field of this program.

| Graduate School / Program                                                            | Research Fields                                                                                                                            | Academic Staff      |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Graduate School of Advanced Science and Engineering / Mechanical Engineering Program | Research and development of energy conversion materials                                                                                    | ICHIKAWA, Takayuki  |
|                                                                                      | Research and development of biomass utilization technology                                                                                 | MATSUMURA, Yukihiko |
|                                                                                      | Research and development of magnetic confinement fusion energy and plasma physics                                                          | SUZUKI, Yasuhiro    |
| Graduate School of Integrated Sciences for Life                                      | Studies on regulation of enzymes involved in cellular signaling                                                                            | ISHIDA, Atsuhiko    |
|                                                                                      | Conservation of organisms based on ecology                                                                                                 | YAMADA, Toshihiro   |
|                                                                                      | Studies on chemical interactions between plants and insects.                                                                               | OMURA, Hisashi      |
|                                                                                      | Thermodynamic studies on interfacial behavior of biorelated substances using model cell membranes, basic science related to drug delivery. | VILLENEUVE, Masumi  |
|                                                                                      | Research of structural organic chemistry in life science.                                                                                  | NEHIRA, Tatsuo      |
|                                                                                      | Environmental dynamics and analysis of trace compounds and reactive oxygen species in the atmosphere and hydrosphere.                      | TAKEDA, Kazuhiko    |
|                                                                                      | Behavior and ecology of wildlife                                                                                                           | NAKABAYASHI, Miyabi |

**Transdisciplinary Science and Engineering Program (Development Science Field)**

| Specialty                                                      | Research Fields                                                                                                                                                                                                                                                                                                                                                                                        | Academic Staff                                            |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Environmental Planning                                         | Living environment planning in buildings and urban area: water environment, landscape and environmental psychology                                                                                                                                                                                                                                                                                     | NISHINA, Daisaku<br>(Retirement at the end of March 2026) |
| Transportation Engineering, Transportation Planning            | Transportation planning methods, evaluation of transport policies, and sustainable development and transport                                                                                                                                                                                                                                                                                           | FUJIWARA, Akimasa                                         |
| Urban and Data Science                                         | Urban planning, smart mobility, travel behaviour, transport network analysis, data driven technology, mobility in built environment, spatial planning, urban environment analysis, decision making in smart energy, big data & machine learning for urban research                                                                                                                                     | FENG, Tao                                                 |
| Environmental Health Science                                   | Epidemiological study focusing on environmental health problems, Development of health care system based on spatial statistics                                                                                                                                                                                                                                                                         | KASHIMA, Saori                                            |
| Sustainable Architecture                                       | Building and urban environmental science for achieving sustainable development in developing world                                                                                                                                                                                                                                                                                                     | KUBOTA, Tetsu                                             |
| Urban Environmental Science                                    | Urban Climate Change Mitigation and Adaptation; Nature-based Solutions; Green Infrastructure; Urban Microclimate, Urban Resilience; Sustainable Urban Forms; Assessment Tools.                                                                                                                                                                                                                         | SHARIFI, Ayyoob                                           |
| Risk Management Technology                                     | Smart urban infrastructure, transportation planning, urban planning, travel behavior analysis, travel survey design, transport network analysis, resilience research, risk analysis                                                                                                                                                                                                                    | CHIKARAISHI, Makoto                                       |
| Biomass Energy Technology, Botany Resources for the Future     | Development of biomass energy technologies and application to developing countries<br>Agricultural ecology and development of sustainable agricultural technologies                                                                                                                                                                                                                                    | XUAN, Tran Dang                                           |
| Ecosystem Conservation and Management Science                  | Research and education on ecology and ecosystem management                                                                                                                                                                                                                                                                                                                                             | HOSAKA, Tetsuro                                           |
| Energy Science and Technology                                  | Renewable energy evaluation and management in developing countries, Numerical models for coastal hazards・disaster prevention・mitigation, Evaluation of climate changes on natural hazards and renewable energy environment.                                                                                                                                                                            | LEE, Han Soo                                              |
| Safety Engineering                                             | Large enclosed-space fire safety: evacuation behavior, disaster prevention plan, thermal fume behavior, risk analysis, evacuation decision making, experimental course (full-scale, model-scale and Virtual Reality), Computational Fluid Dynamics, experimental psychology, evacuation and physiological signal, fire-fighters health investigation, fire experiment                                  | SEIKE, Miho                                               |
| Environmental Genomics and Ecology, Environmental Microbiology | Our research focuses on understanding how microorganisms interact with each other, with their symbiotic hosts and with the environment, both experimentally and through big data analysis. Topics includes the relationship between climate change and microbes, genomic dynamics of pathogenic microbes in habitats, and pathogenic microbes and antibiotic resistance in air and water environments. | MARUYAMA, Fumito                                          |
| Conservation of Biological Resources                           | Research and education on vegetation and landscape ecology of SATOYAMA ecosystems with a wide range of conservation issues.<br>-Geographic distribution patterns of rural landscapes<br>-Biodiversity conservation in SATOYAMA                                                                                                                                                                         | WATANABE, Sonoko                                          |
| Global Change and Biodiversity                                 | To assess and mitigate climate change impacts on forest ecosystem functioning (biomass and carbon dynamics) and biodiversity by big data analysis<br>To develop wildlife-friendly farming and urban landscape planning for biodiversity conservation<br>To understand ecology and behaviour of wildlife (mammals and birds)                                                                            | HISANO, Masumi*                                           |
| Agricultural Chemistry (Agrochemistry)                         | Our group focuses on researching natural products and their applications in agriculture and human health protection, specifically in preventing chronic diseases such as diabetes, obesity, and cancer. In addition, we conduct metabolomic studies to decode the reaction mechanisms of crop varieties under various weather and environmental pressures.                                             | QUAN, Nguyen Van*                                         |