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

May 1, 2024

(Note) 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.

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 KIMURA, Shun-ichi 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 FUJIMORI, Shoichi OKUDA, Takayuki TERAGAITO, Masakazu*
Mathematical Analysis	Differential Equations, Nonlinear Analysis, Dynamical Systems, Potential Theory, Complex Analysis, Scattering Theory, Algebraic Analysis, Asymptotic Analysis, Resurgence Theory.	KAWASHITA, Mishio NAITO, Yuki TAKIMOTO, Kazuhiro HIRATA, Kentaro KAMIMOTO, Shingo SHIMOMURA,Tetsu IKEHATA, Ryo
Probability Theory and Mathematical Statistics	Probability Theory, Stochastic Processes, Financial and Insurance Mathematics, Random Fields, Theory for Multivariate Data Analysis and its Applications, Statistical Inference, Asymptotic Expansion for Statistical Distributions, Resampling Methods, Mathematical Statistics.	INOUE, Akihiko WAKAKI, Hirofumi
Mathematical Sciences	Differential Geometry, Differential Equations, Bayesian Statistics, Knot Theory	MIZUMACHI,Tetsu HASHIMOTO, Shintaro SHIBUYA, Kazuhiro KOTORII, Yuka*

* The faculty members listed in * 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 the faculty members, 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.	N

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	Non-Equilibrium Phenomena in Polymer Physics and Phase Transitions	TODA, Akihiko (Retirement at the end of March 2025)
	Static and dynamic structures and physical properties of structurally disordered matter	INUI, Masanori
	Quantum information theory concerning e.g. quantum entanglement and quantum communication	ISHIZAKA, Satoshi

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 KATAYAMA, Ikuo OKAZAKI, Keishi DAS, Kaushik OKAWA, Makio
Earth and Planetary Chemistry	Magma genesis, Astrobiology, Space exploration, Earth environmental change, Microbial mineralization, Planetary collision process	SHIBATA, Tomoyuki YABUTA, Hikaru* SHIRAISHI, Fumito MIYAHARA, Masaaki KOIKE, Mizuho
Earth and Planetary Physics	Fault mechanics, Earthquake, Material transport, Mantle convection	INOUE, Toru SUDA, Naoki KAWAZOE, Takaaki NAKAKUKI, Tomoeki
Integrated Earth and Ocean Sciences	Geochemical cycles and environmental changes recorded in sedimentary rocks Microbiological and geochemical explorations of subseafloor biosphere Physico-chemical processes in earthquake fault zones Development of analytical techniques of isotopes and trace elements in core samples Diversity and ecology of microbes inhabiting the deep-biosphere	ISHIKAWA, Tsuyoshi (Visiting Prof.) TOMIOKA, Naotaka (Visiting Prof.) HIROSE, Takehiro (Visiting Prof.) MORONO, Yuki (Visiting Prof.) HOSHINO, Tatsuhiko (Visiting Assoc.prof.) Nakada, Ryoichi (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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If you are planning to study under the faculty members, please confirm the following information.
International Program for Collaborative Sciences Enabling the Future

Chemistry Program

Specialty	Research Fields	Academic Staff
Structural Physical Chemistry	[redacted]	

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 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.	NAKAYAMA, Yuushou TANAKA, Ryo
Organic π-Conjugated Materials Chemistry	Education and research on novel organic functional and semiconducting materials such as π-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 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	OOYAMA, Yousuke IMAE, Ichiro IMATO, Keiichi 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 KATAGIRI, Kiyofumi TARUTANI, Naoki 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 TSUNOJI, Nao MINATO, Takuo

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 (Applied Chemistry)	Element-Based Organic Materials Chemistry	Education and research on element-based materials, in particular synthesis and applications polymers with inorganic elements, and development of functional materials with epoch-making optoelectronic characteristics.	OHSHITA, Joji 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 KANEMATSU, Yusuke

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 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 (

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. Analytical studies based on game theory regarding equilibrium and consensus among decision-makers such as individuals and organizations, and development of decision-making methods. 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 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 NAGASAWA, Keisuke
Mathematics	Research on inverse problems and the eigenvalue problems of differential equations. Mathematical analysis of linear PDEs. Dynamical systems and ergodic theory. Research on nonlinear elliptic and parabolic differential equations, and applications to the dynamical system and phenomenological theory. Statistical physics of neural networks.	SHIBATA, Tetsutaro TSUGE, Naoki KAWASHITA, Wakako SANO, Megumi CHUNG, Yong Moo WAKASUGI, Yuta 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 SASAKI, Yutaka TAOKA, Satoshi
Biological Systems Engineering	The main subject of research is the measurement, analysis and modeling of biological functions with its engineering applications. The research area covers human motion analysis, bioelectric signal processing, welfare robotics, artificial life, soft computing, electric circuit design and medical electronics engineering, physical assist devices, haptics, virtual reality, human augmentation, and human interaction, etc.	TSUJI, Toshio KURITA, Yuichi SOH, Zu
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 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 WAKITANI, Shin NAKAMOTO, Masayoshi KINOSHITA, Takuya
	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 TAKAKI, Takeshi 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, e.g., 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; Development of a mobile four arms robot; Estimation and compensation of periodic disturbances; and Analysis and control of human-robot interaction.	KIKUUWE, Ryo MURAMATSU, Hisayoshi
Mechanics of Materials	Experimental study on impact thermo-mechanical and fracture behavior of materials with phase transformation and characterization by observation of	

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 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 NH_3 and H_2O), and/or solid state hydrogen storage materials; Energy recovery from waste and biomass.	ICHIKAWA, Takayuki 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
Fluid Engineering	Large-scale computer simulation of Magnetohydrodynamics 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 dynamical systems theory and data-driven science	SUZUKI, Yasuhiro 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 NOx, low SPM tubular combustion; Micro combustor; Fire safety.	MIYOSHI, Akira 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 JOHZAKI, Tomoyuki 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 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 KAJIMOTO, Tsuyoshi

Transportation and Environmental Systems Program

Specialty	Research Fields	Academic Staff
Structural Systems	Buckling and ultimate strength evaluations Fracture and fatigue strength evaluations Computational Mechanics, Applied Mechanics, Solid/Structural Analysis Research on a floating structure for offshore wind power generation Energy harvesting using mechanical vibration Nondestructive inspection, Numerical electromagnetic field analysis	TANAKA, Satoyuki
Structural Innovation	Research on novel material manufacturing technology and new structural design method for application to transportation equipment. Mathematical research on relationships between transportation equipment industries and economic/social situations. Computational method for structural analysis.	KATAGIRI, Kazuaki YAMAMOTO, Takeki
System Safety	Research on safety assessment and maintenance for structures and transportation equipment systems. Development of sensors for dynamic load and deformation measurement. Development of instrumentation system for structural safety management. Automatic control and planning of ship equipments and systems. Research on planning and design methodology for transportation	SHINTAKU, Eiji TANAKA, Yoshikazu

Transportation System Innovation

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 Research on development of wooden semi-rigid frame structure Evaluating method of residual seismic performance of existing wooden construction Long term performance evaluation of wooden buildings and materials	MORI, Takuro
Building Structures	Seismic design of steel structures Vibration control system of steel structures Beam-to-column connections and column-bases of steel structures Buckling analysis and design of steel frames Seismic retrofit of existing structures	TAGAWA, Hiroshi CHEN, Xingchen
Disaster Prevention Engineering	Earthquake strong motion prediction technology Ground motion evaluation Building damage estimation for scenario earthquakes Remote sensing for disaster response Spatial data analysis for disaster risk evaluation	MIURA, Hiroyuki
Earthquake and Structural Engineering	Seismic performance evaluation and repair/reinforcement technology for non-structural members Durability design of reinforced concrete members Advanced crack reduction technology for reinforced concrete members CO_2 fixation of reinforced concrete members Evaluation of building aesthetics and performance Control of indoor environment by interior materials	TERAMOTO, Atsushi

(Architecture Field)

Specialty	Research Fields	Academic Staff
Urban and Architectural Planning	Urban environmental planning (green, wind, water, climate, hazard, energy, and built environment). Compact city design with population decrease. Sustainable community design with using GIS. Housings in urban and local area. The planning of social welfare and community facilities. The region-based housing supply system. The planning and the management of building production processes.	TANAKA, Takahiro SUMIKURA, Hideaki ISHIGAKI, Aya
Architectural History and Design Theory	Theory on peace architecture and urban design. Theory on environment and landscape design. History of modern architecture and modern urbanism in Japan and World. 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 Psychological evaluation of regional landscape and living environment Energy conservation of buildings Efficient use of renewable energy	NISHINA, Daisaku KINDAICHI, Sayaka
Architectural Project	Design of an environmentally conscious architecture Architectural design using BIM and CFD analysis Design of temporary shelters immediately after the disaster 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	

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 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. 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 ARIO, Ichiro
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 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 FUSE, Masaaki
Environmental Preservation Engineering	Biological wastewater treatment. Energy recovery from biomass by microbes. Nitrogen and Phosphorous removal. Microbial community analysis. Analysis and modelling of behavior of trace toxic chemicals in air and water environments. Application of membrane filtration technique on wastewater treatment.	KINDAICHI, Tomonori OZAKI, Noriatsu
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 INOUE, Takuya
Coastal Engineering	Development of technology to improve environment in river bank Practical use of "sediment microbial fuel cells" more than solar batteries 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
		LEE, Han Soo

Informatics and Data Science Program

Specialty	Research Fields	Academic Staff
Intelligent Systems	Machine learning, High-performance computing, Parallel and distributed computing, Quantum computing, Embedded system	ITO, Yasuaki
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 combinational optimization problems.	NAKANO, Koji

Distributed Systems

Specialty	Research Fields	Academic Staff
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 ANDRADE, Daniel FUKUSHIMA, Makoto YU, Yi
Advanced Information Networks	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
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
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
Leaning Analytics	Statistical growth model, Information system supporting education and learning	SUMIYA, Takahiro
Pattern Recognition	Development of pattern recognition and machine learning algorithms for image understanding, image synthesis, 3D understanding, etc.	AIZAWA, Hiroaki

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 / Mathematics Program	Statistical Science: Theory for Multivariate Data Analysis and its Applications, Statistical Inference, Asymptotic Expansion for Statistical Distributions, Resampling Methods, Mathematical Statistics.	YANAGIHARA, Hirokazu
Graduate School of Advanced Science and Engineering / Transdisciplinary Science and Engineering Program	Research on Media Communication Services	KODAMA, Mei
	Cybersecurity, Confidential Computing	WATANABE, Hidenobu
	Nuclear Theory, Information System	IWASAWA, Kazuo
Graduate School of Humanities and Social Sciences / Economics Program	Econometrics (Time series econometrics, Spatial econometrics), Signal Processing on Graph	Professor

(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 WAKITANI, Shin NAKAMOTO, Masayoshi KINOSHITA, Takuya
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 TAKAKI, Takeshi 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

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 a large-amplitude atomic oscillation under multiple extreme conditions.	ISHII, Isao
High Energy Physics	High Energy Physics and its application: Physics of Tera-scale by high energy electron-positron collider R&D of intense photon sources by the Laser-Compton scattering 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 ba3.1 (d s)22 (t(r)194 ka)10.g.3 (hi)4.310.4 (e-1.1057a)10.3n	

Specialty	Research Fields	Academic Staff
Quantum Properties	Experimental study of fundamental material properties and reactivity for light elements based materials. Main subjects are research and development of hydrogen production, hydrogen storage, and material conversion. Functional materials are newly created through research on material properties and reaction mechanism by original sample synthesis methods and various analyses from wide points of view.	MIYAOKA, Hiroki (Planned to change the program to the Transdisciplinary Science and Engineering Program on June 1, 2024)
	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.	UMEO, 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-	

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, Seiichiro
	Development of new thin-film structure formation technology and research of its application to quantum-effect devices.	HANAFUSA, Hiroaki
Electron Device Engineering	RF/microwave/millimeter-wave CMOS circuit design. Circuit theory. Microwave and millimeter-wave measurement. Device characterization and modeling.	AMAKAWA, Shuhei
Frontier 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
	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 electrone(c)1.79(lo)-41.480.487(e)10	

Specialty	Research Fields	Academic Staff
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

Specialty	Research Fields	Academic Staff
Environmental Earth Sciences	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
Physics of Complex Matter	Static and dynamic structures and physical properties of structurally disordered matter	INUI, Masanori
	Non-Equilibrium Phenomena in Polymer Physics and Phase Transitions	TODA, Akihiko (Retirement at the end of March 2025)
	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
Physics of Correlated Matter	Quantum information theory concerning e.g. quantum entanglement and quantum communication	ISHIZAKA, Satoshi
	Foundation of quantum mechanics and quantum information sciences including quantum computer and quantum artificial intelligence	HATAKENAKA, Noriyuki (Retirement at the end of March 2025)
	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
	Circuit quantum gravity theory concerning e.g. circuit analogue black holes	KATAYAMA, Haruna
Information and Media Sciences		

Specialty	Research Fields	Academic Staff
Environmental Planning	Living environment planning in buildings and urban area: water environment, landscape and environmental psychology	NISHINA, Daisaku
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 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
Transportation Engineering, Transportation Planning	Large enclosed-space fire safety: evacuation behavior, disaster prevention plan, thermal fume behavior, risk analysis, decision making of evacuation start	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. -Geographic distribution patterns of rural landscapes -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 To develop wildlife-friendly farming and urban landscape planning for biodiversity conservation 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