

Department of Materials Engineering Science

Division	Area	Research Group	Keywords	Professor
Materials Physics	Electron Correlation Physics	Theory Group of Strongly Correlated Systems	exotic superconductivity and exotic magnetism	Prof. MIYAKE Kazumasa
		Experiment Group for Spectroscopy of Correlated Materials	Bulk-sensitive photoelectron spectroscopy (hard X-ray and extremely low-energy excitation), bulk-sensitive soft x-ray angle-resolved photoemission, Fermiology for strongly correlated electron systems	Prof. SEKIYAMA Akira
		Experimental Group for Nanoscience	Nanostructures, spintronics	Prof. SUZUKI Yoshishige
	Quantum Physics of Nanoscale Materials	Quantum Information and Quantum Optics Group	quantum information, quantum cryptography, quantum computing, entanglement manipulation, quantum optics	Prof. IMOTO Nobuyuki
		Group for Exploration of Functional Materials	magnetism, ferroelectricity, correlated electron systems, oxides, crystal growth	Prof. KIMURA Tsuyoshi
	Quantum Materials Physics	Experimental Group for Molecular Electronics	organic electronics/spintronics, molecular-scale electronics, scanning probe microscopy/spectroscopy	Prof. TADA Hirokazu
		Optical and Quantum Information Science Group	semiconductor quantum devices, quantum electronics, organic and bio-semiconductor nano-physics	Prof. MATSUMOTO Kazuhiko
	Quantum Information Photonics	single photon, photon information processing, quantum measurements, photo-devices, nano-photonics	Prof. TAKEUCHI Shigeki	
	Condensed Matter Physics	first-principles calculation, condensed matter theory, materials prediction and design, magnetism, ferroelectricity, superconductivity, multiferroics	Prof. OGUCHI Tamio	
Chemistry	Synthetic Chemistry	Synthetic Organic Chemistry Group	Environmentally benign process for molecular transformations, Simulation of enzymatic functions with metallo- and organocatalysts, Creation of functional organometallics	Prof. NAOTA Takeshi
		Synthetic Polymer Chemistry Group	Stereospecific Living Polymerization, Stereoregular Polymers, Precision Polymer Synthesis, Uniform Polymers, Functional Polymers, Polymer Characterization	Prof. KITAYAMA Tatsuki
		Organometallic Chemistry Group	Design and Synthesis of Homogeneous Molecular Catalysts, Organometallic Complexes, Metal Nanoclusters, Chiral Complexes, and Molecular Devices	Prof. MASHIMA Kazushi
	Molecular Organization Chemistry	Surface Chemistry Group	Novel Functions at Surfaces and Interfaces, Catalysis, Photocatalysis, Electron Transfer at Interfaces, Reaction Mechanism, Functional Molecular Tip, Nano-structuring	Prof. FUKUI Ken-ichi
		Biological Chemistry Group	Nucleic acids chemistry, Chemical synthesis of oligonucleotides, DNA damage, DNA repair, Biomolecular recognition, Protein-nucleic acid interactions	Prof. IWAI Shigenori
Solar Energy Chemistry	Solar Energy Conversion	New materials for solar cells; Chemical processes for solar cell fabrication; Photocatalysis; Nanometer-sized metal particles; Nano-porous catalysts	Prof. MATSUMURA Michio	
Chemical Engineering	Chemical Reaction Engineering	Nanoreaction Engineering Group	Chemical reaction engineering, porous materials, inorganic membranes, afforestation in arid land	Prof. NISHIYAMA
		Quantum Chemical Engineering group	Quantum dynamics, Quantum nonlinear optics, Reaction mechanisms of living systems, Materials-oriented quantum chemistry	Prof. NAKANO Masayoshi
		Design of High-Performance Catalyst Group	Green Chemistry, Environmentally-benign organic synthesis, Inorganic crystallites, Dendrimer, Nanocluster	Prof. JITSUKAWA Koichiro
	Environment and Energy System	Transport Phenomena Group	Fluid Mixing, Micro-Unit Operation, Information of Fluid Dynamics, Applied Nonlinear Dynamics, Percolation	Prof. INOUE Yoshiro
		Transport Phenomena Control Group	Control of Heat and Mass Transfer, Liquid-Liquid Interface, Phase Change, Computational Fluid Dynamics	Prof. OKANO Yasunori
		Physical Chemistry Group	High-pressure Phase Equilibria, Gas Hydrate, Molecular Cluster, Global Warming, Energy Cascading	Prof. OHGAKI Kazunari
	Bioprocess Engineering	Biofunctional Materials Design Group	Membrane Stress Biotechnology, Bioseparation, Immobilized Liposome Chromatography, Stress Sensor System, Aqueous Two-Phase Systems, Reverse Micellar System, Conformational Abnormality of Protein	
Bioreaction Engineering Group		Bioprocess, Bioreactor, Gene/metabolic Engineering, Tissue Engineering, Environment Bioengineering	Prof. TAYA Masahito	
Solar Energy Chemistry	Environmental Photochemical Engineering Group	Photocatalysts, Photofunctional Materials, Highly Selective Transformation of Organic Compounds, Photoluminescent Molecular Devices and Sensors	Prof. HIRAI Takayuki	
Frontier Materials Science	Frontier Materials	Experimental Group for Materials Science by Nuclear-Magnetic-Resonance Spectroscopy	NMR/NQR Studies under Multiple Physical Environments, Novel Phases of Condensed Matters, High-Temperature Superconductivity, Quantum Magnetism, Strongly Correlated Electrons Systems	Prof. KITAOKA Yoshio
		Experimental Group for Functional Molecules	Development of Functional Organic Materials for Optoelectronic Applications, Supramolecular Chemistry based on Two-Dimensional Self-Assembly on Surfaces, Creation of Functional Materials based on Multiple Molecular Interactions	Prof. TOBE Yoshito
		Theory Group of Advanced Materials Science	Computational materials design, Numerical simulation of many-body systems (Elucidation and prediction of new phase of matters under extreme conditions, The first-principles calculations and its development based on the quantum simulation).	Prof. KATAYAMA-YOSHIDA Hiroshi (Associate Prof. KUSAKABE Ko-ichi)
	Dynamics of Nanoscale Materials	Experimental Group for Coherence of Nanoscale Materials	Optical properties of semiconductor ultrathin films and nanoparticles, and strongly-correlated electron systems, Nonlinear laser spectroscopy, Ultrafast time-resolved spectroscopy, THz spectroscopy, SEM-cathodoluminescence	Prof. ASHIDA Masaaki
		Experimental Group for Fluctuation Dynamics in Condensed Phase	photochemistry, photofunctional molecule, three-dimensional three-pulse photon echo, time-resolved microscopy, single-molecule measurement, biomolecular fluctuation	Prof. MIYASAKA Hiroshi
Quantum Science in Extreme Conditions	Experimental Group for Materials Science in Extreme Conditions	Material science at extreme conditions. Quantum transition; superconductivity, magnetism and structural transitions at high pressures	Prof. SHIMIZU Katsuya	
	Experimental Group for Materials Engineering Science in Nano-structure	Nano-fabrication of solids and semiconductors, Hetero-structure of oxides, Nano-materials device, Electronics of functional oxides	Prof. TANAKA Hidekazu	

Department of Mechanical Science and Bioengineering

Division	Area	Research Group	Keywords	Professor
Nonlinear Mechanics	Mechanics of Fluids and Thermo-fluids	Thermal Engineering and Science Group	Turbulent Flows, Turbulence Control, Heat Transfer Enhancement, Drag Reduction, Inverse Heat Transfer Analysis, Heat Transfer Optimization, Unsteady and Chaotic Thermal Convection Fields	Prof. KAWAHARA Genta
		Fluid Mechanics Group	Nonlinear Waves and Oscillations, Stability, Acoustics, Thermoacoustics, Shock, Soliton, Chaos, Break-up of liquid sheets and drops, Capillary effects, Level-set method, Periodic structures and localization, Localized mode	Prof. SUGIMOTO Nobumasa
	Mechanics of Solid Materials	Strength of Structure and Materials Group	Dynamic behavior of materials and structure, Biomimetics of plants, Hydrogen embrittlement of metals, Mechanical properties of functional materials, Development of new structural materials	Prof. KOBAYASHI Hidetoshi
		Solid Mechanics Group	Noncontact ultrasonic measurements, Characterization of emerging functional materials, Electromagnetic acoustic sensing, Biosensors, Resonance Ultrasound Microscopy, Micromechanics	Prof. HIRAO Masahiko
Mechanical Engineering	Propulsion Engineering	Molecular Fluid Dynamics Group	Artificial Organs, DNA Nanodevices, Fuel Cell and Lithium ion batteries, Plasma Sciences, Mathematics and Applications of Molecular Fluid Dynamics	Prof. KAWANO Satoyuki
		Fluids Engineering Group	Turbomachinery, Fluid Machinery, Cavitation, Instability, Supersonic Flow, Unsteady Flow	Prof. TSUJIMOTO Yoshinobu
	Mechano-informatics	Robotics and Mechatronics Group	Human-Robot Interface, Analysis of Human Movements, Human-like Musculoskeletal Robots, Human Skills Transfer to Robots, Robotic Orthosis, Assistance System for Single-Incision Laparoscopic Surgery	Prof. MIYAZAKI Fumio
		Theoretical Solid Mechanics Group	Nano-Meso-Macro-Mechanics, Chemo-Electro-Bio-Mechanics, Predictive Multiscale-Multiphysics Modeling and Simulation	Prof. OGATA Shigenobu
Bioengineering	Biomechanical Engineering	Biomechanics Group	Biomechanics of cells, tissues, and organs, Functional adaptation and remodeling, Biomaterials and tissue engineering, Computational biomechanics, Biofluid dynamics, Biomechanical Imaging	Prof. WADA Shigeo
		Mechanical and Bioengineering Systems Group	Biomechanical System Modeling, Computational Biomechanics, Cardiovascular Biomechanics, Rehabilitation Engineering, Welfare Engineering, Adaptive Structures and Systems, Optimum/Adaptive Structural Design, Smart Design Engineering	Prof. TANAKA Masao
		Bio-mechanical/physical informatics Group	Human model, Living Informatics, Bio-mechanical/physical signal analysis, Human stress sensing/control, Affordance analysis/design	Guest Prof. MATSUOKA Katsunori
	Biophysical Engineering	BioSystem Engineering Group	Cell Engineering, Tissue Engineering, Stem Cell Biotechnology, Regenerative Medicine, Brain-Machine Interface, Genome Science, Nanobiotechnology, Bioenergetics, Three-dimensional protein structure, Structural Biology, Biophysics, Protein Science	Prof. MIYAKE Jun
		Bio-Dynamics Group	Nonlinear dynamical system theory and its application to biology, Physiome, In silico human, Motor control, Biological rhythms, Cardiac arrhythmias, Systems biology	Prof. NOMURA Taishin
	Biomedical and Biophysical Measurements	Biomedical Photonics Group	Biomedical optics, Nanometer-scale optical profiler, Laser associated non-linear photonics, Analysis of chemical component in blood vessels and blood dynamics, Biosensor	Prof. ARAKI Tsutomu
Bioimaging Group		Biomedical measurement, Medical image, CG, Visualization, Display system, VR, Haptic rendering, Human-computer interaction, Communication, Information sharing, Physics-based simulation	Prof. OSHIRO Osamu	

Department of Systems Innovation

Division	Area	Research Group	Keywords	Professor
Advanced Electronics and Optical Science	Solid State Electronics	Nanoelectronics Group	Nano CMOS transistors, Functional semiconductor thin film, Nanodots, Functional memory materials, Transmission electron microscopy, Electron-beam analysis	Prof. SAKAI Akira
		Optoelectronics Group	Thin-film solar cells, Thin-film displays, Amorphous semiconductors, nano-crystalline semiconductors, Modulation spectroscopy	Prof. OKAMOTO Hiroaki
		Nano-scale Physics & Device Group	Molecular spintronics, Silicon spintronics, Spin current, Graphene, Carbon nanotube, π -electron molecule, Ge-based transistors, Tactile sensor	Prof. SHIRAIISHI Masashi
	Advanced Quantum Devices and Electronics	Advanced Quantum Device System Group	Nuclear quadrupole resonance (NQR), Mine detection, Baggage inspection, Nondestructive Evaluation, Superconducting interference device (SQUID), High temperature superconducting electronics	Prof. ITOZAKI Hideo
		Advanced Quantum Information Device Group	Quantum computers, Quantum information, Nuclear magnetic resonance (NMR), Electron spin resonance (ESR)	Prof. KITAGAWA Masahiro
	Optical Electronics	Microwave Photonics Group	Planar antennas, Adaptive antennas, Microwave photonics, High speed light modulators, Integrated optical circuits, Photonics crystals, Optical measurements, Optical scattering, Random media	Prof. OKAMURA Yasuyuki
		Information Photonics Group	Millimeter- and terahertz-wave photonics, Nano-structure photonics, Metamaterials, Ultrafast electronics, Photonic signal processing and measurement, Communication systems	Prof. NAGATSUMA Tarao
Cooperation	Quantum Electronics Group	Laser cooling, Quantum information, Quantum optics, Ion trap, Laser stabilization, Frequency standard	Prof. URABE Shinji	
		Nanoelectronics under extreme conditions Group	Semiconductor nanoprocessing, Beam processing, Vacuum nanoelectronics, Field Emission Displays (FEDs), Field emission nano electron source, CNT electron source, Quantum electronics, Nanometer analysis and characterization	Prof. TAKAI Mikio
Systems Science and Applied Informatics	System Theory	Systems and Control Group	Dynamical Systems, Systems Analysis, Control Systems Design, Applications of Control Theory	Prof. OHTSUKA Toshiyuki
		Systems Analysis Group	Signal Analysis, Systems Analysis, Adaptive System, Intelligent Media Processing	Prof. IIGUNI Youji
	Intelligent Systems	Robotics Group	Robot Mechanism, Robot Vision, Ambient Intelligence, Nano-Micro Robotics, Humanoids & Multi-Legged Robots, Safety & Security Robotics	Prof. ARAI Tatsuo
		Intelligent Robotics Group	Interactive Intelligent Robots, Android Science, Learning and developing robot, Bio-inspired Robotics, Intelligent sensor network, Pattern Recognition, Brain-Machine Interface	Prof. ISHIGURO Hiroshi
		Pattern Measurement Group	Vision Sensing, Image Engineering, 3D Measurement, Intelligent Sensing, Digital Archives	Prof. SATO Kosuke
	Human Interface Group	Human Communication, Intelligent User Interface, Media Technology, Web Intelligence, Mobile Computing	Prof. NISHIDA Shogo	
Mathematical Science	Mathematical Modelling	Differential Equation Group	Nonlinear partial differential equations, Variational methods, Singularity formation, Applied stochastic differential equations, Mathematical sciences	Prof. NAWA Hayato
		Applied Analysis Group	Nonlinear mathematics, Mathematical modeling, Numerical simulation, Mathematical medicine, Nonlinear partial differential equations, Self-dual gauge theory, Nonequilibrium thermodynamics, Fluid mathematics, Scientific computation, Ill-posed problems	Prof. SUZUKI Takashi
	Statistical Science	Statistical Analysis Group	Statistical Graphics, Spline Smoothing, Nonlinear Regression Analysis, Longitudinal Data Analysis	Prof. SHIRAHATA Shingo
		Statistical Science Group	Multivariate analysis, Structural equation modeling, Statistical causal inference, Graphical modeling, Statistical inference of diffusion processes	Prof. KANO Yutaka
Mathematical Science for Social Systems	Mathematical and Statistical Finance	Research Group of Statistical Inference	Financial data analysis, Time series analysis, Statistical information loss, Actuarial mathematics, Media data analysis, Mathematical statistics	Prof. UCHIDA Masayuki
		Research Group of Mathematical Modeling in Finance	Long-term optimal investment, Dynamic portfolio selection, Dynamic portfolio insurance/protection, Asset price modeling, Stochastic volatility/correlation modeling, Exclusion process, Zero-range process, Hydrodynamic limit	Prof. SEKINE Jun
		Research Group of Stochastic and Mathematical Finance	Portfolio optimization, Derivatives pricing and replication strategies, Stochastic control, Bellman equations, Modified Zakai equations, Monte Carlo Methods, Malliavin Calculus, Asymmetric market models	Prof. NAGAI Hideo
	Theoretical Systems Science	Research Group of Complex Systems	Discrete event systems, Hybrid systems, Embedded systems, Nonlinear systems, Neural circuit model, Evolutionary game, Cyber-physical systems	Prof. USHIO Toshimitsu
		Research Group of Mathematical Models and Computations	Decision making, System optimization, Fuzzy systems, Combinatorial optimization, Game theory, Data mining, Supply chain management	Prof. INUIGUCHI Masahiro