Interdisciplinary Graduate School
of Science & Engineering

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Interdisciplinary Graduate School of Science & Engineering

Innovative and Engineered Materials
Electronic Chemistry
Materials Science and Engineering
Environmental Science and Technology
Built Environment
Energy Sciences
Environmental Chemistry and Engineering
Electronics and Applied Physics
Mechano-Micro Engineering
Computational Intelligence and Systems Science
Information Processing

TOKYO INSTITUTE OF TECHNOLOGY

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Interdisciplinary Graduate School of Science & Engineering

History

Establishment of the Interdisciplinary Graduate School

The Interdisciplinary Graduate School of Science and Engineering was founded at the Nagatsuta Campus (currently Suzukakedai Campus) in April 1975, as a pioneering example of increasing the emphasis on graduate schools. When it was founded, the Interdisciplinary Graduate School consisted of 72 Chairs (Koza): 25 Fundamental Chairs (Kikan Koza) and 47 Cooperative Chairs (Kyoryoku Koza). The School had 10 departments; Information Processing, Electronic Chemistry, Social Development, Precision Machinery Systems, Materials Science Engineering, Applied Electronics, Chemical Environment Engineering, Biochemistry, Energy Science, and Systems Science.

Self-transformation of the Interdisciplinary Graduate School

From the foundation of the school until 1987, 10 Chairs (Fundamental Chairs and Cooperative Chairs) were added. With the foundation of the Dept. of Bioscience and Biotechnology, the Dept. of Biochemistry was renamed the Dept. of Intelligence Science in April 1991. The department shifted its educational and research focus to intelligence, a phenomenon of life processes, and relocated instructors, setting a precedent for self-transformation in the Interdisciplinary Graduate School. From 1993 to 1996, the Dept. of Environmental Engineering was established, and the Dept. of Social Development and the Dept. of Energy Science were reorganized to form the Dept. of Built Environment and the Dept. of Energy Sciences. The Dept. of System Science and the Dept. of Intelligence Science were also reorganized to form the Dept. of Computational Intelligence and Systems Science. In April 1997, the Dept. of Innovative and Engineered Materials was established from the two departments of Electronic Chemistry and Materials Science Engineering, and these two departments were reorganized to form the Dept. of Electronic Chemistry and the Dept. of Materials Science and Engineering. Because of these changes, all the Fundamental Chairs of these departments have become Macro Chairs (Daikoza) and the departments have also established positions for collaborative professors and associate professors, introducing new styles of organization. To respond to social changes and demands, many departments were reorganized from 1998 to 2005 to form the following departments; Environmental Chemistry and Engineering, Environmental Science and Technology, MechanoMicro Engineering, Electronics and Applied Physics, and Information Processing. Since its foundation, our Graduate School has been constantly transforming. As of December 2013, it provides education and research through 81 Chairs (24 Fundamental Chairs and 57 Cooperative Chairs) and 11 departments.

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- Information Processing

Innovative Platform for Education and Research — P.11
- Innovative Platform for Education and Research Doctoral Course
- Electrochemical Energy Devices Core Unit
- Urban Earthquake Disaster Reduction Core Unit
- Nanoelectronics Research Frontier Core Unit
- Synthetic Biology Core Unit
- Medical Engineering Core Unit
- Atmospheric Plasma Processing Core Unit

Number of Faculty Staff — P.13
Number of Students / Percentage of internal students

Suzukakedai Campus Map — P.14
Access

Features of the Interdisciplinary Graduate School of Science and Engineering

The Interdisciplinary Graduate School of Science and Engineering (IGS) primarily consists of two types of chairs, *fundamental chairs* and *cooperative chairs*. *Fundamental chairs* are operated by IGS faculty members, while *cooperative chairs* are run by non-IGS faculty members who are associated with research laboratories and research centers at the Institute. IGS also offers *affiliated chairs* by collaborative faculty members with high-level research backgrounds invited from government agencies, research laboratories, companies, and other organizations outside the Institute. *Affiliated chairs* are designed to provide students with education and research guidance from multilateral perspectives.

Breaking academic boundaries through cross-sectional learning in three types of chairs to create a synergy with industry

Affiliated Chairs

41 Affiliated Chairs
87 Faculty Staffs

- Ministry of Education, Culture,Sports, Science and Technology
- Ministry of Health, Labour and Welfare
- Japan Aerospace eXploration Agency
- Japan International Cooperation Agency
- RIKEN
- National Institutes of Natural Sciences
- National Institute of Advanced Industrial Science and Technology
- National Institute for Environmental Studies
- Central Research Institute of Electric Power Industry
- Nippon Telegraph and Telephone Corporation
- TOSHIBA
- National Institute of Informatics
- IBM Japan, Ltd.
- HITACHI
- NIPPON STEEL & SUMITOMO METAL CORPORATION
- others

Cooperative Chairs

57 Cooperative Chairs
116 Faculty Staffs

- Frontier Research Center
- Precision and Intelligence Laboratory
- Materials and Structures Laboratory
- Imaging Science and Engineering Laboratory
- Research Laboratory for Nuclear Reactors
- Chemical Resources Laboratory
- Materials Research Center for Element Strategy
- others

11 Departments

Fundamental Chairs

24 Fundamental Chairs
133 Faculty Staffs

Materials

- Innovative and Engineered Materials
- Electronic Chemistry
- Materials Science and Engineering

Environment and Energy

- Environmental Science and Technology
- Built Environment
- Energy Sciences
- Environmental Chemistry and Engineering

Information and System

- Electronics and Applied Physics
- Mechano-Micro Engineering
- Computational Intelligence and Systems Science
- Information Processing

Same as undergraduate

As an independent graduate school with no undergraduate departments, the Interdisciplinary Graduate School of Science and Engineering accepts students from a variety of backgrounds, not only from national, public, and private universities in Japan but also from advanced courses in technical colleges and overseas universities.

- Public university
- Private university
- Overseas university
- Technical college
- TOKYO INSTITUTE OF TECHNOLOGY

The number of Chairs and Teaching Staff is the current complement as of August 1st 2013.

DEPARTMENTS

The major courses of the Interdisciplinary Graduate School of Science and Engineering can be categorized into 3 large groups. These categories are referred to as Materials, Environment and Energy, and Information and Systems. Also, each of these major courses and the various related fields has been displayed as a matrix in the following chart. The school covers a wide range of academic fields in this manner.

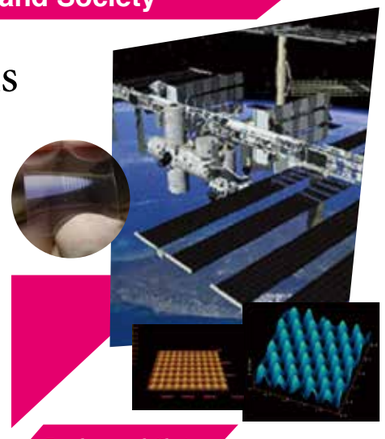
The Areas of Research		Materials	Nanotechnology	Chemistry	Environment	Earthquake, disaster	Energy	Machinery	Physics	Electronic and optical devices	Medical care, biology	Hardware systems	Software systems	Society, economy	Information	Mathematical science
Materials	Innovative nad Engineered Materials	■	■	■												
	Electronic Chemistry	■		■												
	Materials Science and Technology	■														
Environmental and Energy	Environmental Science and Technology				■	■	■					■	■	■		
	Built Environment				■	■										
	Energy Sciences				■		■	■	■		■					
	Environmental Chemistry and Engineering	■		■	■						■					
Information and System	Electronics and Applied Physics	■	■							■		■				
	Mechano-Micro Engineering							■			■	■				
	Computational Intelligence and Systems Science										■		■	■	■	■
	Information Processing											■	■		■	

Materials

Materials Innovation for Brighter Future of our Earth and Society

Innovative and Engineered Materials

There are high expectations for the development and application of new processes and materials in the substance and materials fields in the hope that they will bring safety to society, such as the sustainable maintenance of the global environment, the realization of an energy saving-oriented society, and the creation of new industry. The Department of Innovative and Engineered Materials provides education and research that enable its students to acquire an advanced and practical ability to lead Japan and the world in astonishing technological progress. Departmental research covers interdisciplinary fields that include physics, chemistry, biotechnology, materials science and energy. Departmental research themes are intended to maximize the characteristics of substances and materials, and they include electronic functions, superconducting, dynamic functions, energy conversion, space technology and science, medical technology, ecological technology, and semiconducting technology. In order to systemize these things, the department actively adopts nanoscience and nanotechnology, and engages in front-line research. Departmental faculty staff comes from 24 laboratories, and consists of principal faculty members in charge of Fundamental Chairs, faculty members from three associated research laboratories who take charge of Cooperative Chairs, and faculty members who come from external organizations and take charge of Cooperative Chairs. In order to train capable students to acquire advanced planning capabilities, and cultivate open minds and humanity in harmony with the global environment and technology, the department implements project-oriented educational research for doctoral courses, including unified doctoral educational programs, advanced personal training programs, and Materials G-COE. In addition, the department also works actively on doctoral programs for corporate researchers so that they can work and study in a balanced manner.



Fundamental Chairs

- Environmental Materials Engineering and Science
  Environmental Materials Production, Substitutional Functional Materials, Natural Environmental Characteristics, Materials Frontiers, Material Cycle Evaluation, Extreme Materials science (collaborative), and Materials Science for Expanding Environmental Limitations (collaborative)

Cooperative Chairs

- Highly Functional Materials Engineering and Science
  Highly Functional Thin Films, Physical Functional Correlations in Materials, and Highly Functional Material Design
- Transient Phase Materials Science and Engineering
  Extreme Processing and Surface Functionalityfaculty

Pioneering science from the electrons' perspective

Electronic Chemistry

The Department of Electronic Chemistry was established in April 1997 with the goal of creating new fields of study by expanding its predecessor, which was established at the time of the opening of the Interdisciplinary Graduate School of Science and Engineering. This department covers both the fundamental principles and applications of chemistry, and promotes education and research that represent the 21st century. The department' s major goal is to understand chemical phenomena in a unified way from the electrons' perspective, based on the idea that chemical reactions take place by means of electron transfer process. Specifically, the department consists of laboratories covering a broad range of fields, including organic synthetic chemistry, organic electrochemistry, green chemistry, organic functional chemistry, polymer chemistry, lithium cells, fuel cells, bio cells, electroanalytical chemistry, inorganic solid-state chemistry, nanotechnology, complex chemistry, catalytic chemistry, organometallic chemistry, laser spectroscopy and biochemistry. The department has a fullystaffed research organization that consists of 8 chairs and employs 14 professors and 13 associate professors, including collaborative faculty members. In the Department of Electronic Chemistry, which has faculty members from a wide range of fields as mentioned above, students can thoroughly absorb the cutting-edge knowledge of chemistry and relevant fields through lectures and practical work as well. The curriculum consists of lectures so that students can acquire the ability to conduct activities in the future in the pure chemistry field, and diverse fields related to chemistry, such as material science, biochemistry, and energy conversion. Graduates from the department have been very active in a wide range of fields and organizations, including the industrial world, research institutes and universities.

Fundamental Chairs

- Molecular Process
- Material and Energy Conversion

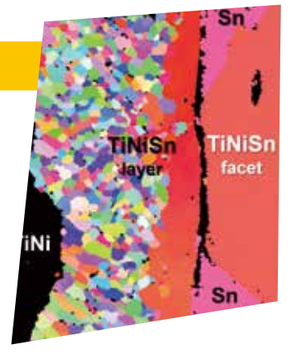
Cooperative Chairs

- Complex and Electrochemistry
- Bioelectronic Chemistry
- Organoelectronic Chemistry
- Spectroscopic Chemistry
- Catalytic Chemistry
- Solid State Chemical Physics

Pioneering the future of materials science

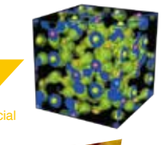
Materials Science and Engineering

Materials are the key to innovative development of science and technology. The Department of Materials Science and Engineering was established in April 1997 by expanding its predecessor established at the time of opening the Interdisciplinary Graduate School of Science and Engineering, the Department of Materials Science and Engineering, in order to explore new materials science of the 21st century. The department promotes education and research as a department where students can study a wide range of fields from the basic principles to application of materials science, physics and chemistry in the academic field that represents the 21st century. The department is made up of a productive research organization with 11 chairs. The specific characteristics of the department are: (1) It consists of staff members and students from various professional fields not limited to physics, chemistry and materials science. (2) It works closely with the University's Research Laboratories, and is equipped with the world's finest facilities with the world' s finest teaching staffs. The department has a unique education system including Academy for Co-creative Education of Environment and Energy science. (3) It actively encourages students to go abroad, provides well-developed basic coursework, and offers classes for students to make presentations in English and enhance their ability to express themselves in English. Our students willingly write journal papers in English by themselves (about 60 papers on average per year), participate in international conferences, and present their papers (about 40 papers on average per year). (4) A scholarship system is provided, and the department holds Career Development lectures, which help students choose career paths and get jobs. (5) About 250 persons have completed master's degrees and about 50 persons have completed doctoral degrees over the past five years, and they have been active in various kinds of business, including research projects in science and engineering.



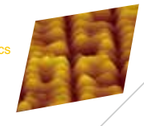
Fundamental Chairs

- Materials Structure and Functions
  Composite Physical Properties, Mesoscopics, Structural Function Characteristics, and Material Response
- Quantum and Surface Materials Science
  Surface Materials, Nonequilibrium Phases, and Quantum Materials



Cooperative Chairs

- Design of Environmentally Beneficial Materials
- Materials Processing with Low Environmental Loads
- Structure and Diffraction Physics
- Electro Active Materials
- Synergistic Materials
- Materials Evaluation
- Materials Structure Design
- Frontier Materials Science
- Functional Materials Analysis for Element Strategy



Creation of environmental world leaders for a sustainable society

Environmental Science and Technology

Environmental problems become conspicuous when they cross international borders and may have complex and serious implications. The resolution of such problems requires the development of policies based on the power of science and technology. Moreover, international mutual collaboration is indispensable for the realization of a sustainable society, something that cannot be realized in one country alone. The Department of Environmental Science and Technology is aiming to make a further leap forward on the basis of a new educational and research policy: “The training of comprehensive environmental specialists who will play leading roles in international society.” This department admits not only Japanese science students who have an interest in environmental issues, but also actively recruits international students and humanities students who have a strong sense of internationalism. Fieldwork is incorporated into the coursework, and a heuristic problem-solving approach for education and research on actual environments is emphasized. The lecture courses, a large number of which are offered in English, form a program of study through which students can acquire knowledge and skills in environmental science from the basic to the specialist level. For this reason, in addition to the fundamental and cooperative chairs shown on the right, external lecturers from collaborative organizations such as the Japan International Cooperation Agency (JICA), National Institute for Environmental Studies, National Institute for Land and Infrastructure Management, Central Research Institute of Electric Power Industry are also invited to lecture in order to provide a diverse approach to the study of the environment, including international fields. Graduates of this department are actively involved in a wide range of careers in public agencies, local governments, universities, government and private research institutes, and international organizations, as well as in various private sectors.

Fundamental Chairs

- Natural Environment
  Environmental Hydraulics and Hydrology
  Geoenvironmental Exploration
  Atmosphere Transport Analysis
  Material Cycles Analysis
- Social Environment
  Urban Environment
  Urban Atmospheric Environment
  Environmental Planning and Policy Making

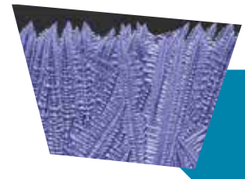
Cooperative Chairs

- International Environmental Cooperation
- Frontier of Environmental Science and Technology
- Environment and Material Engineering
- Environment and Structural Engineering
- Environment and Safety Engineering
- Process System Engineering
- Environment and Energy Engineering

Pursuit of energy science that is ahead of the times

Energy Sciences

There have been discussions on the recent rapid increase in energy consumption due to human activities since it is suspected of causing abrupt changes in the global environment, such as global warming. Thus, reflecting on our disorderly mass consumption of energy, we need to develop clean energy sources including renewable energy, and techniques for using energy in an environmentally friendly way. In order to make international contributions to energy issues, such as diversifying energy sources, improving the efficiency of energy use, and using energy in an environmentally friendly way, it should be natural that dealing with issues solely through the current compartmentalized study is unfruitful. We need to take an interdisciplinary approach encompassing many academic fields in promoting research and development from the fundamentals right through to applications. The Department of Energy Sciences aims to cultivate creative researchers and engineers with advanced knowledge and wide-ranging insight so that they can survey the global environment and social systems from the viewpoint of energy science and tackle various energy issues. The department also aims to create a leading-edge academic field which can address energy issues from many directions. The department promotes education and research activities with other organizations of the Tokyo Institute of Technology, such as the Research Laboratory for Nuclear Reactors, the Graduate School of Science and Engineering, and external research organizations, such as the Central Research Institute of Electric Power Industry, National Institute of Advanced Industrial Science and Technology, Japan Aerospace Exploration Agency, High Energy Accelerator Research Organization and Toshiba Corporation’ s Power and Industrial Systems Research and Development Center so that students can acquire the abilities needed for solving problems from the viewpoint of science and engineering.



Fundamental Chairs

- Energy Environment Science
- Energy Conversion Engineering
- High Energy Density Science

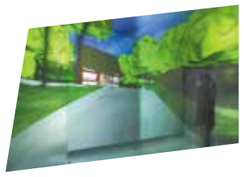
Cooperative Chairs

- Energy Environment System
- Energy Conversion System
- High Energy Density System

Human and Environment. Creating a secure and comfortable society

Built Environment

With the arrival of the 21st century, human activities have been expanding to a previously unimaginable extent. A crisis regarding long-established living environments caused by these activities has gradually come to the surface. In order to overcome this crisis, engineers and researchers who can facilitate interdisciplinary approaches to long-established academic fields and that have a comprehensive viewpoint are being sought by society for the creation of a desirable living environment for human beings, and the establishment of a new environmental framework for the environments. In response to this social need, the Department of Built Environment was established as an academic field that combines architecture, civil and space engineering, and environmental psychology in order to train and send out into the world students as individuals who can meet both Japanese society ’s and global needs. In order to help solve the various problems our society is currently facing and will face in the future, the Department of Built Environment is composed of various fields of research listed below that study human living environments from three principles,: “Venustas, Utilitas, and Firmitas,” namely aesthetics, utility, and stability. The efforts made by the Department of Built Environment since its establishment in 1995 have been recognized, and the Department was selected in 2008 as an international base for urban seismic engineering for the reduction of “mega risks” with regard to natural disasters under the GCOE Program. The Department has been striving to improve still further as a research and educational institute. As we are faced with recent critical threats to the global environment, we think that the interdisciplinary research and education efforts the Department of Built Environment have created academic fields which are essential to our future society.



Fundamental Chairs

- Built Environment Evaluation
  Architectural Design and Design Theory;
  Architectural History and City History;
  Streetscape Renewal and Conservation;
  Environmental Perception and Cognition;
  Visual Environment and Environmental Psychology;
  and Psychoacoustics and Architectural Acoustics
- Human Environment and Urban Planning
  National Land and City Planning;
  Transportation Planning and Environmental Planning;
  Energy System Analysis; Global Warming Measures;
  and City planning with Citizen Participation
- New Frontier Infrastructure
  Earthquake Engineering; Prevention of Urban Earthquake Disasters; Fire Protection Safety Engineering; Probabilistic Earthquake Engineering; Anti-seismic Structure Design; Analysis and Design of Architectural Structures; Space Structures Engineering; Deployable Structures; and Morphology

Cooperative Chairs

- Landscape Engineering

Science and engineering in pursuit of a new environmental chemistry.

Environmental Chemistry and Engineering

The Department of Environmental Chemistry and Engineering was established in April 1998 with the aim of creating a new academic field for the 21st century. Its formation comes from the expansion of the long-standing predecessors and stuff members working at the time of the opening of the Interdisciplinary Graduate School of Science and Engineering, Department of Chemical Environment Engineering. The department’ s purpose is the establishment of a new academic field for tackling environmental problems from every angle with chemistry as its base. Research based on chemistry provides the development of new molecules, materials, and devices which provide the new insight required for the solutions for environmental problems. There are a wide range of environmental problems ranging from the local to the globa environments. Just focusing on one small field will not lead to a fundamental solution to environmental problems. Students and faculty members working in cooperative research have discovered and developed new cutting-edge world leading technologies and a sustainable society. The department has a wide range of laboratories specialized synthetic chemistry, polymer chemistry, biochemistry, analytic chemistry, physical chemistry, geochemistry, catalytic chemistry and chemical engineering. The department holds a productive research organization offering nine Chairs with ten professors, nine associate professors, and two lecturers, including cooperative faculty members. The students engaged in this program tackle a myriad of environmental problems by studying within a wide range of fields. At present graduate students are employed in a various fields, the knowledge and skills acquired at the department becomes important throughout their professional lives.

Affluent environmental society is realized through chemistry.

Fundamental Chairs

- Environmental Analysis and Engineering
  Chemical Ecology System Analysis
  Sustainable Systems
- Catalysis and Green Chemistry
  Solid Catalysis and Biocatalysis
  Environmentally-friendly Chemistry

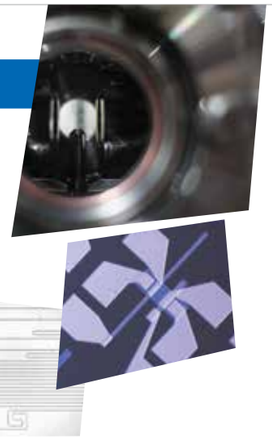
Cooperative Chairs

- Environmental Molecular Arrangement
- Chemical Process Design
- Polymer Processes
- Chemical Environmental Process Synthesis
- Environmentally Benign Molecular Design
- Environmental Biotechnology
- Environmental Material Science

Innovative nanodevices and materials for the new generation of ICT

Electronics and Applied Physics

The Department of Electronics and Applied Physics provides education and research on advanced materials, nanotechnology, optical devices, silicon integrated circuits, and other leading-edge materials and devices that support the field of information and communication technology (ICT). The creation of next-generation ICT requires a deep understanding of physics regarding the properties and precise control of new materials as well as a technological foundation at the highest level. It requires that these be employed as the basis for new concepts to be used in the creation of photonic and electronic devices, and furthermore, in the creation of human-inspired devices. Moreover, it is necessary to mutually link and integrate the functions of individual devices to realize the functions they possess as a system. The department functionally integrates materials and devices that are seemingly incompatible, by creating new materials in the ICT field, by searching for new solid-state properties, and by conducting research on new device systems that involve photonics, electronics, and the human-inspired devices. In doing so, the department aims to promote the creation of the field of advanced information device systems, and to promote education and research in this field. The department consists of two Fundamental Chairs (Advanced Devices and New Functional Devices) and five Cooperative Chairs. The department has faculty members in a wide range of specialized fields based on electronics and physics, and maintains a mutually and closely cooperative system. The department also invites visiting collaborative faculty members in cooperation with external research organizations for improving doctoral programs. Graduates from the department have been active in the ICT field and other fields in Japan and overseas, including industries, public research institutes and universities.



Fundamental Chairs

- Advanced Devices
  Integrated Functional Devices,
  Intelligent System Devices,
  Creative Functional Materials Engineering
- New Functional Devices
  Functional Quantum Fields,
  Evolutional Functional Devices,
  Functional Nanodevices,
  Creative Information Devices

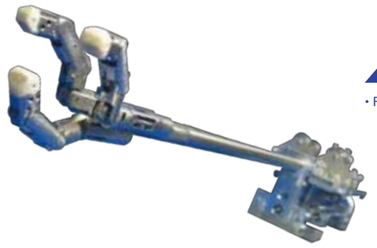
Cooperative Chairs

- Imaging Materials
- Frontier Materials and Devices
- Photonic Devices and Systems
- Intelligent Electron Devices and Systems
- Integrated Photonics

Creation of a user-friendly and green advanced machinery system

Mechano-Micro Engineering

Conventional engineering fields mainly based on mechanical engineering are now being recognized as a new interdisciplinary academic field covering electronics, control engineering, production engineering and information engineering. This department aims to create an advanced machinery system and establish a methodology for it that will become very important for establishing a new type of industry and society in the near future. The faculty members of Fundamental Chairs and faculty members from the Precision and Intelligence Laboratory, who specialize in mechanical engineering and take charge of Cooperative Chairs, participate together in the education and research of the Department of Mechano-Micro Engineering. They provide a thorough fundamental education for all new students so that each one can acquire a deep understanding of and knowledge in fields other than their specialized fields. They also provide attentive guidance and help the students to develop practical skills that will become useful after graduation. Major research fields cover interdisciplinary studies including advanced mechatronics, extremely fine devices, robotics and biotechnology. Research results in the department have contributed to the establishment and development of new academic fields in engineering and science related to production, security and safety. In addition, both departmental research and educational curricula cover new and large interdisciplinary fields, like the biomedical engineering field, and the research is conducted in cooperation with Tokyo Medical & Dental University.



Fundamental Chairs

- Functional Creation

Cooperative Chairs

- Extremely Fine Devices
- Advanced Mechatronics
- Advanced Mechanics and Engineering Design

The ability to function as a system.

Computational Intelligence and Systems Science

Systems that can transform their structures through interaction with the environment like living organisms and produce new functions in real-time are called complex adaptive systems. Evolution, learning and development are typical examples of the emergent behavior of complex adaptive systems. The Department of Computational Intelligence and Systems Science was established in 1996 with the objective of scientifically understanding the emergent principles of these complex adaptive systems, and establishing design principles for intelligent functions based on the findings. In 2000, the department set forth a basic framework composed of four principles with complex adaptive systems as the foundation, as follows: (1) experimental and mathematical approach to design principles of life and brain, (2) system science for analyzing and understanding humans and society, (3) engineering realization of autonomous intelligence, and (4) strategy to create an emergent society for generating diverse functions. In the Department of Computational Intelligence and Systems Science, researchers who are leaders in the fields mentioned above form a knowledge hub, and carry out cutting-edge research in collaboration with foreign and domestic education and research institutions and business corporations. The department' s objective for education is to create creative leaders who can take the leadership in cutting-edge fields. Because of this, the department has been actively working on education in relation to creativity and planning ability in doctoral programs, and guidance for research activities concerning doctoral theses. In addition, it helps the students acquire basic knowledge through lectures and practice and offers guidance to help them produce master theses under master' s programs. Furthermore, students can take a variety of optional courses, such as lectures with cutting-edge themes, and research education offered by faculty members from external corporations and research institutes.

Cooperative Chairs

- Computational Perception and Recognition
- Neural Information Processing
- Brain Science

Fundamental Chairs

- Fundamental Intelligent System
  Theoretical Intelligent Systems
  Language Informatics
  Cognitive Informatics
  Intelligence Informatics
  Statistical Mathematics Frontier (collaborative) Informatics Frontier (collaborative) Industrial Science and Technology Frontier (collaborative)
  Basic Science Frontier (collaborative)
- Complex System Analysis
  Theoretical Complex Systems
  Adaptive Learning Systems
  Autonomous Decentralized Control
  Behavioral Control of Sensory Adaptive Systems (collaborative)
- Emergent System
  Emergent Function Formation
  Emergent Computation
  Evolutionary Systems
  Multi-agent Systems (collaborative)
  Emergent Social Systems (collaborative)

Pursuit of human-oriented information integration systems

Information Processing

The Department of Information Processing was established for the purpose of investigating and teaching science and technology aimed toward human-oriented information integration systems. The basic goals of the department are the integration of problems between different fields of study, the integration of problem-solving methods, and the integration of the values at which science, technology, people and society aim. The department promotes: (1) comprehensive research and education which apprehend human functions and engineering technology in terms of human science, information technology, infrastructure systems, and measurement and control technology, and (2) creative research and education for the creation of people-friendly (and easy to use) advanced information systems in a nearfuture society. To be specific, the department has an expert teaching staff in the fields of human science, sensory information processing systems, brain information, human communication, image processing, ambience communication, telemedicine technology, network interfaces, parallel computer technology, multi-dimensional signal processing, security, microroprocessors, ultrasonic measurement, actuators, and biometrics. The department provides integrated education and research with the help of the teaching staff. The Department of Information Processing opens a gate for graduates from diverse fields, including mathematics and physics, electricity and information, measurement and control, mechanics, and chemistry, and helps them to acquire specialized knowledge and tackle advanced research through the department's education programs provided from its own unique viewpoint. The department also emphasizes the provision of curricula and a support system to cultivate researchers who can play an active role in each professional arena. Many of those who have completed the courses are active in various fields including academic societies and the industrial worl

Fundamental Chairs

- Future-oriented Information Systems
  Human Information Systems,
  Future-oriented Information Media and InformationEnvironments
- New Functional Information Systems
  High Functionality Information Systems,
  Information Linkage Systems,
  and Intelligent Information Systems

Cooperative Chairs

- Perceptual Image Processing
- Advanced Image Science
- Advanced Wave Application Systems
- Bio-Information Systems
- Sensory Information Systems
- Discrete Structures and Systems

INNOVATIVE PLATFORM for EDUCATION and RESEARCH

In the Interdisciplinary Graduate School of Science and Engineering (IGS), the *Innovative Platform for Education and Research (IPER)* was established in April 2010. The Platform consists of the Education and Research Core Group and the IPER Doctoral Course. The overall management of the Platform is conducted by the Steering and Management Committee. The Education and Research Core Group consists of core units led by professors of IGS. The core units actively engage in research projects in advanced research fields. The Core Group aims to facilitate awareness of core unit research activities by prospective IGS applicants from both inside and outside the Institute. The Core Group also supports all aspects of core unit activities on behalf of IGS. As shown in the figure, six core units are currently in operation. Please see the following page for more details. The IPER Doctoral Course was formulated for the advancement and enrichment of doctoral education at the Institute. This new course aims to foster creative minds to meet the needs of society, where various opportunities await our graduates. The course consists of three sub-courses, described on page 11-12.

Innovative Platform for Education and Research Doctoral Course

Education and Research Core Group

Steering and Management Comittee

The Education and Research Core Group consists of core units selected from research units conducting noteworthy research in leading fields. The Group provides information on research activities of each research unit to prospective candidates from both inside and outside the Institute. The six core units of the Group are as follows.

Innovative Platform for Education and Research Doctoral Course

Features of the Innovative Platform for Education and Research Doctoral Course

1 Students can acquire extensive hands-on experience, which would otherwise be difficult to obtain in conventional doctoral programs, through a curriculum designed to instill a global perspective.

2 Students can improve their ability to communicate in English through daily interactions with international lecturers.

3 Students are eligible for financial aid in the forms of employment as research assistants (RA) and in short-term overseas seminars during summer vacation.

4 A credit completion certificate is issued to the students when all requirements of the course are satisfied. In addition, when they earn their doctoral degrees they receive a diploma and a course completion certificate.

Transdisciplinary Technologist Training Sub-Course

This sub-course is designed to train students to integrate humanities, sciences, and other disciplines with their own areas of expertise to become leaders able to utilize their extensive knowledge in a variety of social arenas.

Leading Scientist Training Sub-Course

This sub-course is designed to grow capable researchers ready to take on tomorrow' s challenges. Students of this sub-course can earn a doctoral degree while participating in research projects, enabling them to acquire the knowledge and experience necessary to lead in internationally organized endeavors.

Creative Pioneer Training Sub-Course

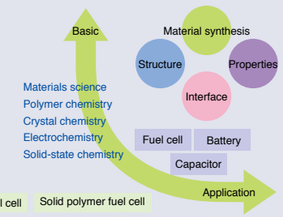
This sub-course is designed to cultivate highly creative entrepreneurs. Based on the Institute' s longstanding traditions of *Monotsukuri*, or technical ingenuity, and "collaboration with industry in engineering," students are taught to create new value through integration of scientific technologies related to their doctoral work with those of other fields. The sub-course aims to foster entrepreneurs able to seed research with commercial feasibility.

Admissions capacity for each sub-course is approximately 10 students. The Transdisciplinary Technologist Training Sub-Course is open not only to students of the Interdisciplinary Graduate School of Science and Engineering, but to all graduate students of the Institute.

Education and Research Core Group

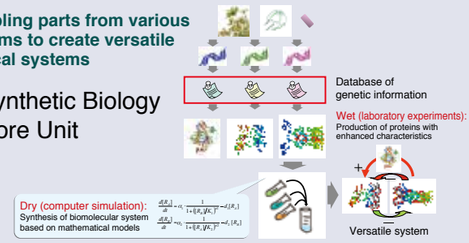
Development of innovative next-generation batteries

Electrochemical Energy Devices Core Unit



Assembling parts from various organisms to create versatile biological systems

Synthetic Biology Core Unit



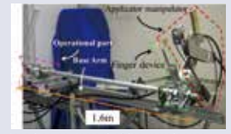
Development of advanced technologies for reducing urban seismic mega risk

Urban Earthquake Disaster Reduction Core Unit

Seismic response control building

Advanced medical and healthcare engineering for a comfortable and rich life

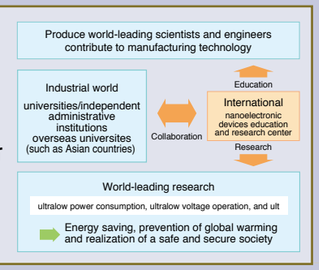
Medical Engineering Core Unit



Insertion equipment of the remoteness of the small radiation source for oral cavity cancer therapies

For the prevention of global warming and safe and secure society

Nanoelectronics Research Frontier Core Unit



Atmospheric plasma system for development of innovative processing

Atmospheric Plasma Processing Core Unit

Atmospheric plasma generation with wide variety of plasma gases characteristics of these atmospheric plasmas provide innovative nano-material synthesis, surface modification, medical applications and waste treatment.

DATA

Interdisciplinary Graduate School of Science and Engineering as seen in numbers

Number of Faculty Staff

(unit:people)

Department	Professor	Associate Professor	Lecturer	Assistant Professor	Coordinate Professor	Coordinate Associate Professor	Visiting Associate Professor
Innovative and Engineered Materials	8	9	0	4	7	0	0
Electronic Chemistr	8	9	2	4	5	5	0
Materials Science and Engineering	9	12	0	3	5	1	0
Environmental Science and Technology	9	12	0	4	6	4	0
Built Environment	7	5	0	5	5	4	0
Energy Sciences	7	8	1	5	5	1	0
Environmental Chemistry and Engineering	10	6	3	3	6	1	0
Electronics and Applied Physics	10	7	0	2	7	0	0
Mechano-Micro Engineering	8	6	1	2	1	0	0
Computational Intelligence and Systems Science	13	10	1	8	11	6	1
Information Processing	9	5	0	2	4	2	0
Total	98	89	8	42	62	24	1

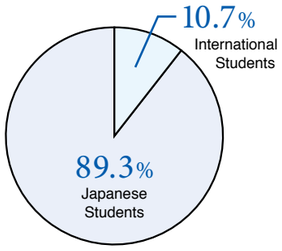
Number of Students

(unit:people)

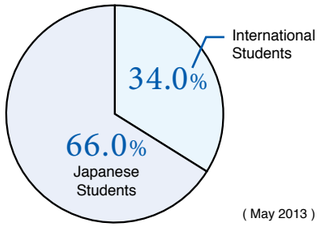
Department	Master's Course						Total	Doctoral Course								Total	Total
	1st year		2nd year		Total			1st year		2nd year		3rd year		Total			
	M	F	M	F	M	F		M	F	M	F	M	F	M	F		
Innovative and Engineered Materials	44	4	43	4	87	8	95	14	6	12	4	17	3	43	13	56	151
Electronic Chemistr	43	9	45	9	88	18	106	13	5	12	3	20	3	45	11	56	162
Materials Science and Engineering	41	6	40	4	81	10	91	3	0	6	1	15	1	24	2	26	117
Environmental Science and Technology	39	6	37	13	76	19	95	10	8	7	2	14	10	31	20	51	146
Built Environment	32	11	42	17	74	28	102	5	0	6	4	14	8	25	12	37	139
Energy Sciences	40	3	44	3	84	6	90	9	0	8	0	11	2	28	2	30	120
Environmental Chemistry and Engineering	40	4	34	6	74	10	84	12	2	7	1	16	5	35	8	43	127
Electronics and Applied Physics	44	5	48	1	92	6	98	7	1	10	2	18	1	35	4	39	137
Mechano-Micro Engineering	37	1	38	2	75	3	78	8	0	4	3	3	0	15	3	18	96
Computational Intelligence and Systems Science	73	10	79	5	152	15	167	25	7	23	3	42	7	90	17	107	274
Information Processing	50	2	55	4	105	6	111	15	2	12	2	26	3	53	7	60	171
Total	483	61	505	68	988	129	1117	121	31	107	25	196	43	424	99	523	1640

Percentage of International students

Master course students



Doctor course students



(May 2013)

CAMPUS MAP

Suzukakedai

S Area
1. S1 Bldg.
2. S2 Bldg.

R Area
1. R1 Bldg.
2. R1-Annex A
3. R1-Annex B
4. R2 Bldg.
5. R2-Annex A
6. R2-Annex B
7. R2-Annex C
8. R3 Main Bldg.
9. R3-Annex A
10. R3-Annex B
11. R3-Annex C
12. R3-Annex D

G Area
1. G1 Bldg.
2. G2 Bldg.
3. G3 Bldg.
4. G4 Bldg.
5. G5 Bldg.
6. MHD

H Area
1. H1 Bldg.
2. H2 Bldg.

J Area
1. J1 Bldg.
2. J2・J3 Bldg.

ACCESS

[Ookayama Campus]

Ookayama Station on the Tokyu Oimachi and Tokyu Meguro Lines
About 45 minutes from Haneda Airport,
About 100 minutes from Narita Airport,
About 30 minutes from Tokyo Station

[Suzukakedai Campus]

Suzukakedai Station on the Tokyu Den'entoshi Line
About 70 minutes from Haneda Airport,
About 130 minutes from Narita Airport,
About 55 minutes from Tokyo Station

[Tamachi Campus]

Tamachi Station on the JR Yamanote and Keihin-Tohoku Lines
About 25 minutes from Haneda Airport,
About 90 minutes from Narita Airport,
About 10 minutes from Tokyo Station