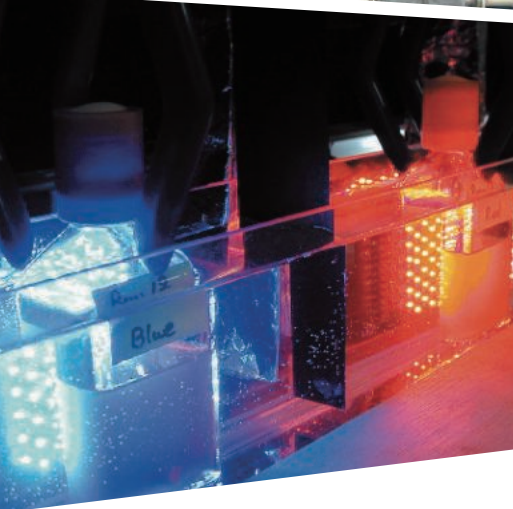


# 100<sup>th</sup> ANNIVERSARY

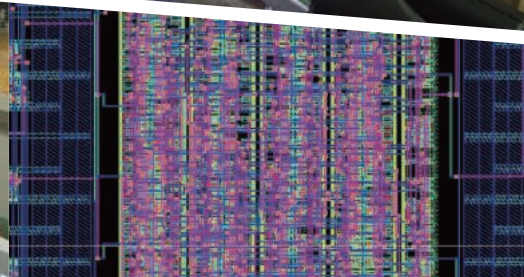
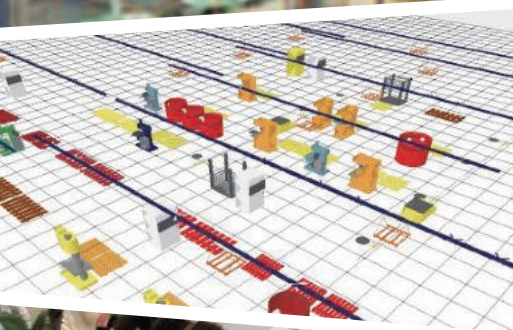
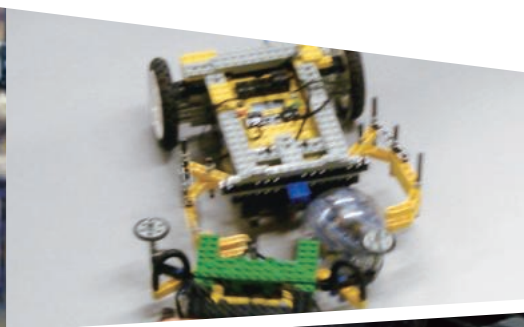
Faculty of Engineering,  
Kobe University celebrates  
its 100th anniversary  
in 2021.



# KOBE UNIVERSITY

FACULTY OF ENGINEERING  
GRADUATE SCHOOL OF ENGINEERING

- ARCHITECTURE
- CIVIL ENGINEERING
- ELECTRICAL AND ELECTRONIC ENGINEERING
- MECHANICAL ENGINEERING
- CHEMICAL SCIENCE AND ENGINEERING
- COMPUTER SCIENCE AND SYSTEMS ENGINEERING





# MESSAGE

## WELCOME TO THE GRADUATE SCHOOL AND FACULTY OF ENGINEERING.



*Naoto Ohmura*

Dean,  
Graduate School  
of Engineering  
Professor

**OHMURA Naoto**

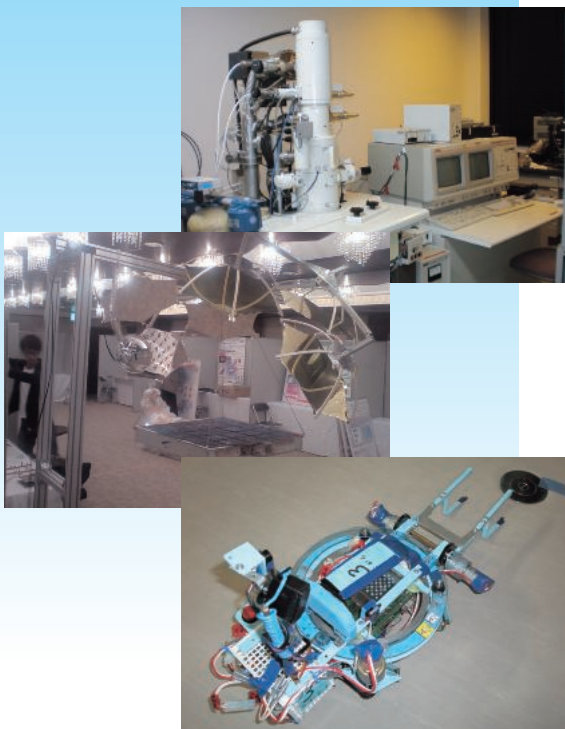
**T**he Faculty of Engineering consists of six departments: Architecture, Civil Engineering, Electric and Electronic Engineering, Mechanical Engineering, Chemical Science and Engineering, and Computer Science and Systems Engineering. The Graduate School of Engineering consists of the first five departments, excluding Computer Science and Engineering. We offer a wide variety of education and research, ranging from fundamental science and liberal arts to innovative engineering, with the aim of fostering human resources who can play leading roles in the realization of a sustainable, safe, and secure society.

**T**he Graduate School of Engineering has seven interdisciplinary research centers. By collaborating with these research centers, the Graduate School and Faculty not only provide cutting-edge research facilities and training for students, but also equip students with

a bird's-eye perspective of their fields. Through our research and educational programs, students are able to acquire the necessary skills to become active engineers and researchers, including problem-solving abilities, creativity, design-focused thinking, and communication and presentation skills.

**A**t present, about 300 overseas students study in either the Graduate School or the Faculty of Engineering at Kobe University. Fostering globally-oriented human resources is one of the key missions of Kobe University and we place great importance on internationalization in all Engineering disciplines. The Faculty and Graduate School offer an excellent research and educational environment and heartily welcome students from all over the world, especially those who wish to take on the challenge of exploring new corridors and fields in engineering.





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# HISTORY

## FACULTY OF ENGINEERING

**T**he Faculty of Engineering was established in 1949, growing out of the former Kobe Technical College, which was originally established in 1921. Since then, it has contributed to the development of modern industrial society in the latter half of the 20th century through its education and research. The aim of the Faculty in the new millennium is to educate future researchers and engineers empowering them in contributing to the welfare of humankind through cutting-edge technologies.

The Faculty now has six departments: Architecture, Civil Engineering, Electrical and Electronic Engineering, Mechanical Engineering, Chemical Science and Engineering, and Computer Science and Systems Engineering, each of which consists of several divisions dedicated to the specific purposes of education and research. Approximately two-thirds of the students continue on to a Master' s program.

## GRADUATE SCHOOL OF ENGINEERING

**T**he Graduate School of Engineering was established in April 2007 as an educational and research institute aimed at providing engineering knowledge and fundamental and applied technologies directly related to the symbiosis and sustainable development of society, reorganizing the Graduate School of Science and Technology, which was established in 1981. It offers a consistent educational system from undergraduate to graduate school.

The Graduate School of Engineering offers the following five departments in both Master' s and doctoral degree

programs: Architecture, Civil Engineering, Electrical and Electronic Engineering, Mechanical Engineering, and Chemical Science and Engineering. By covering a wide range of interdisciplinary academic fields (environment, nanomaterial, information and telecommunication, life science, energy, robot, safety, etc.), these five departments are committed to delivering new technologies for the betterment of society.

# ADMISSION POLICY

## FACULTY OF ENGINEERING

**W**ith six courses of study in the Faculty of Engineering, we seek to nurture researchers and engineers who will open a path to the next generation. Students perform original and advanced work on the international stage, in addition to acquiring an understanding of the basic knowledge essential in each cutting-edge technological and scientific field. After graduation, the road for students to move forward to studies at the Graduate School of Engineering is wide open, allowing them to cultivate an even higher level of expertise and obtain the abilities needed for self-motivated research and development. Moreover, since students can choose to study abroad for a fixed period at overseas universities having partner relationships with the Faculty for education and research, we have created a system that enables students to gain an international perspective at the same time as they

study in their chosen field of expertise. To ensure that students are able to comfortably understand basic and major concentration courses offered after admission to the faculty, the extent of their basic knowledge and thoroughness of understanding of different subjects are evaluated through the designated Center Examination and the individual examinations that serve as the faculty's entrance requirements. The Faculty of Engineering at Kobe University cherishes people with lively curiosity, inquisitive minds, and a critical nature towards those things that cannot be understood merely by applying common sense, and we offer an environment where these traits can be taken full advantage of. The faculty welcomes all individuals who are full of the desire to contribute to the harmonious co-existence of the natural world and human society in the near future through scientific and technological fields.

## GRADUATE SCHOOL OF ENGINEERING

**A**lthough policies and standards for student admission differ depending on the homeland organization of the students wishing to enter the Graduate School and the major field welcoming the student, we have drawn up the following common guidelines for prospective students.

- 1) Applicants display enthusiasm for clarifying the principles behind natural phenomena, as well as for the application and development of technology, and have a strong desire to find problems on their own and attempt to resolve them.
- 2) Applicants are equipped with creativity and practical abilities.

- 3) Applicants have logical thinking abilities and persuasive power when presenting the results of research and in similar situations.
- 4) Applicants have ethical standards and the ability to understand and question the effects of technology on society.
- 5) Applicants have a clear awareness of their future direction (becoming researchers or professionals with a high level of expertise).
- 6) Applicants have a strong desire to acquire even higher-level and more advanced knowledge and technology among professionals who already have a great deal of practical experience.

## INTERNATIONAL ACTIVITIES AT THE KOBE UNIVERSITY GRADUATE SCHOOL OF ENGINEERING AND FACULTY OF ENGINEERING

**K**obe University has concluded several academic exchange agreements with other educational and research organizations at universities overseas, either between the universities themselves or between departments. We carry out joint research, exchanging teaching staff, students, and information in fields of mutual academic and educational concern. For student exchanges, we have put into place detailed agreements on the mutual non-collection of tuition and other fees, and students can go on exchange with the knowledge

that the course credits they obtain at their overseas university will be accepted at their home university.

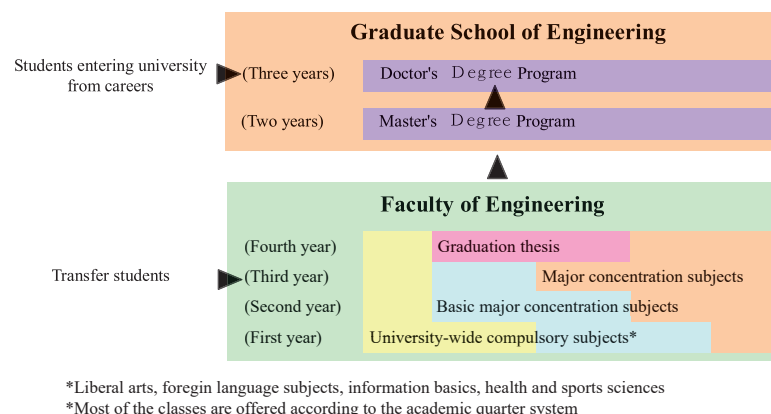
**B**ased on these set programs, many students from the Graduate School and Faculty of Engineering study abroad at partner universities, under a credit transfer system. We also accept a number of exchange students from overseas to pursue their studies in the international atmosphere of the city of Kobe.



## FACULTY OF ENGINEERING

University students enrolled in the Faculty of Engineering are expected to obtain an extensive education and fundamental knowledge and be able to develop technology with an eye on the future of humanity. To this end, we believe our students, with their youthful, flexible intellects, need to be able to study freely and independently to become full-fledged members of society, while developing a feel for the advanced, high-level technology around them. While about 70% of Faculty of Engineering students go on to graduate school after completing the undergraduate program, graduates who leave us directly for the business world do not necessarily proceed in their own field of study, but rather advance in a wide variety of fields. Taking this into consideration, we have prepared a range of course subjects with the aim of training generalists in diverse fields. Along with strong grounding in the fields of the core curriculum, which is based on the central fields of engineering study, the Faculty of Engineering at Kobe

University endeavors to instill in our engineers strong engineering ethical standards. After passing the graduate research examination in the fourth year, students are awarded a Bachelor's degree.



## GRADUATE SCHOOL

At graduate school, students first do the coursework part of the graduate program and then enter the dissertation-writing phase of the doctoral program. September 2007 saw the reorganization of the existing Graduate School of Science and Technology and its new incarnation. In addition to systematically developing a consistent educational program from the start of undergraduate studies until the completion of graduate work, the Graduate School of Engineering also looks to present a fundamental way of thinking for education and

research that stresses original research into basic knowledge and the student's specialization. The framework of the Graduate School of Engineering's educational program is a curriculum of engineering courses thoroughly covering the traditional areas of engineering scholarship, including a rich variety of programs (program course, multiple major course and cooperative education programs) to enhance the level of graduate school education.

### Number of Faculties

(As of May 1, 2015)

	Professors				Total
	Associate Professors				
	Assistant Professors				
	Research Associates				
Faculty of Engineering	51	56	26	5	138
Total of Kobe Univ.	553	503	228	19	1,303



### Number of Students

(As of May 1, 2015)

Number of Students	Undergraduate Students				Graduate Students				Total
			Intl. Students				Intl. Students		
Faculty of Engineering	2,393	(318)	33	(10)	863	(113)	57	(20)	3,256
Total of Kobe Univ.	11,696	(4,025)	200	(107)	4,695	(1,555)	950	(548)	16,391

( ) : Number of female students

# DEGREE PROGRAM

## MASTER'S DEGREE PROGRAM

**T**he Graduate School of Engineering's education and research is dedicated to cultivate human resources with a wide range of knowledge in their specialized field, and interdisciplinary perspectives. The school especially focuses on fostering researchers and highly specialized professionals who are rich in creativity, and possess multifaceted perspectives. Students are granted a Master's Degree in Engineering when they complete this program.

▶ Highly specialized main courses established through

further development and deepening of the undergraduate engineering courses.

- ▶ Education in the area of integrated engineering with a number of advanced courses for interdisciplinary engineering education.
- ▶ Fostering of human resources educated through multi-major course (a major and several sub-majors).
- ▶ Medical Engineering Course for people who hold a full time job. (Master program to foster core human resources for manufacturing)

## DOCTOR'S DEGREE PROGRAM

**F**urther developing and deepening of courses offered in the Master's Degree Program. This program is to foster researchers, academic members of higher education and research institutions, and highly specialized professionals who are highly creative, international-minded, and have an excellent ability to establish, explore, and solve problems by themselves. A Doctor's Degree, either a Dr. of Engineering or a PhD will

be granted upon completion of the program.

- ▶ A strict coursework of research for dissertation.
- ▶ Finding problems, designing research plans, conducting research, organizing research results, finding possible ways to solve unsolved problems and then organizing and reporting these possibilities.
- ▶ Fostering of human resources educated through multi-major course (a major and several sub-majors)

# COMMON-USE FACILITIES

## -INTERNATIONAL STUDENT CENTER

**T**he International Student Center is one of the university-wide research/teaching facilities established in April 1993. It provides international students with education in Japanese language and Japanese studies. It also offers consultations on problems encountered in studying or living in Japan. In its aim to promote international academic exchange programs, the Center supports overseas study for Japanese students studying at Kobe University. The local community is very important for the International Student Center; therefore, it actively promotes projects to strengthen ties between international students and local organizations, as well as programs to help international students improve their Japanese language abilities.

[http://www.kisc.kobe-u.ac.jp/english/i\\_topics.html](http://www.kisc.kobe-u.ac.jp/english/i_topics.html)

## -SCHOOL OF LANGUAGES AND COMMUNICATION

**T**he School of Languages and Communication (SOLAC) was established in October 2003 in response to a call for more international communication

at Kobe University. SOLAC aims to provide language-related support to the greater university community by introducing self-access rooms and CALL facilities for independent study, as well as developing more effective curricula, methodologies, and teaching materials for language courses. In addition, it plays an active role in promoting post-graduate research and education in the fields of language, culture, and communication.

<http://solac.cla.kobe-u.ac.jp/index-e.html>

## -MEDICAL CENTER FOR STUDENT HEALTH

**T**he Medical Center for Student Health was established in April 1970. Services provided by the Center include annual medical checkups for all students and staffs, as well as special checkups for X-ray and/or radioisotope users and new overseas students. Emergency medical treatment is also available. Doctors and nurses as well as counselors are available to provide consultation or advisory service on physical and mental health issues.

<http://www.health.kobe-u.ac.jp/>





# STRUCTURE AND DIVISIONS



## Faculty of Engineering /Graduate School of Engineering

Departments	Divisions	Education/Research Fields
<b>Architecture</b>	<b>Spatial Design</b>	Architectural and Environmental Design/ Structural Design/ Structure and Information System/ Environmental Management
	<b>Architectural Planning</b>	History and Theory of Architecture/ Urban and Regional Planning/ Housing Environment and Safety Planning
	<b>Architectural Structural Engineering</b>	Steel Structure/ Reinforced Concrete Structure/ Structural Control of Dynamics
	<b>Architectural Environmental Engineering</b>	Planning of Acoustic and Lighting Environments/ Thermal and Environmental Planning
<b>Civil Engineering</b>	<b>Engineering of Human Safety</b>	Structural Engineering for Urban Safety/ Geotechnical Engineering for Urban Safety/ Transport Systems Engineering/ Geotechnical Engineering for Disaster Reduction/ Earthquake Disaster Mitigation Engineering/ Disaster-prevention Engineering for River Basin
	<b>Engineering of Environmental Symbiosis</b>	Environmental Fluid Engineering/ Engineering of Hydrospheric Environment/ Geo-environmental Engineering/ Urban Preservation Engineering/ Urban Preservation Engineering/ Urban and Transport Planning and Management
<b>Electrical and Electronic Engineering</b>	<b>Physical Electronics</b>	Mesoscopic Materials/ Photonic Materials/ Quantum Functional Engineering/ Nano-Structure Electronics/ Electromagnetic Energy Physics
	<b>Computer and Information</b>	Integrated Circuit Information/ Computer Engineering/ Information and Communication Engineering/ Algorithms/ Intelligent Learning Theory
	<b>Cooperative Division</b>	Functional Thin-Film Engineering
<b>Mechanical Engineering</b>	<b>Heat Transfer and Fluid Engineering</b>	Advanced Fluid Engineering/ Multiphase Fluid Dynamics/ Energy Conversion Engineering
	<b>Materials Physics and Mechanics</b>	Structural Safety Evaluation/ Fracture Control Engineering/ Structural and Functional Materials
	<b>System Design</b>	Function-Oriented Robotics/ Sensing Device Engineering/ Advanced Manufacturing Systems
	<b>Innovative Materials and Nano Engineering</b>	Nano Electro Mechanical Systems/ Materials Design and Fabrication Engineering
	<b>Cooperative Divisions</b>	Intelligent Production Systems/ Adaptive Function Model/ Wisdom-based Manufacturing
<b>Chemical Science and Engineering</b>	<b>Applied Chemistry</b>	Organic Reactions/ Inorganic Materials Chemistry/ Synthetic Organic Chemistry/ Soft Matter Interface/ Smart Polymer Chemistry/ Material Physical Chemistry/ Tailor-made Materials Chemistry/ Functional Analytical Chemistry/ Biofunctional Materials Chemistry
	<b>Chemical Engineering</b>	Membrane Engineering/ Catalysis and Catalytic Reaction Engineering/ Material-surface Engineering/ Transport Science and Engineering/ Fluid and Particle Engineering/ Drying Process Engineering/ Bioproduction Engineering/ Bioprocess Engineering
	<b>Cooperative Division</b>	Localized Reactions and Physical Properties of Materials/ Chemical Energy Conversion Process/ Biofunctional Engineering/ Pharmaceutical Design and Production Engineering/ Chemical Biosensing
<b>Computer Science and Systems Engineering</b>	<b>Systems Science</b>	Systems Planning/ Optimum System Design/ Applied Optics/ Systems Control/ Mathematical System Analysis/ System Analysis/ Intelligent Systems
	<b>Information Science</b>	Mathematical Logic and Statistics/ Processor Architecture/ Software Science/ Telecommunications/ Integrated Information Systems/ Knowledge and Information Processing/ Media Informatics/ Emergent Computing
	<b>Computational Science</b>	Basics of Computational Science/ Computational Intelligence/ Computational Fluid Dynamics/ Simulation Techniques/ Computational Molecular Engineering/ Computational Biology/ Computational Robotics/ Computational Space Science and Engineering
	<b>Cooperative Divisions</b>	Applied Robot Science/ Kansei and Media Art/ Large Scale Computational Science/ Applied Computational Science

\*With respect to this department, a Graduate School of System Informatics is established in 2010 with three departments in both the Master's and Doctor's Degree Programs.

# ARCHITECTURE

SYMBIOSIS OF ARCHITECTURE AND ENVIRONMENT, CREATION OF SAFE AND COMFORTABLE LIVING SPACE



Exercise in architectural design and planning at the studio



Presentation of design projects

## PHILOSOPHY OF THE DEPARTMENT

**A**rchitecture is an eminently universal field of learning, concerning the creation of housing and architectural facilities as necessary components of human life. In order to respond to both universal and up-to-date architectural problems, it is necessary not only to study basic fields of architecture (design and planning,

structural engineering, environmental engineering) but also to synthesize them for spatial and temporal design problems. The Department of Architecture aims at rearing talented professionals who can correspond synthetically to contemporary architectural challenges, by providing education with both specialization and synthesis.

## CONTENT OF THE EDUCATION

**T**he undergraduate program starts with liberal arts and basic subjects on natural and information science, followed by basic and applied subjects of architecture covering design and planning, structural engineering, and environmental engineering, and continues to synthetic and practical spatial design education.

The Master's program aims at the acquirement of higher knowledge of design and planning, structural engineering,

and environmental engineering, and at the same time training for deducing specific answers to spatial and temporal design problems.

The doctoral program aims at the construction and cultivation of theory associated with design and planning, structural engineering, and environmental engineering to produce international talent with sophisticated special knowledge.

## STRUCTURE AND DIVISIONS

### -SPATIAL DESIGN DIVISION

**Synthetic and practical education and research on the creation of space:**

Architectural and Urban Design, Housing and Community Design, Structural Engineering and Design Building Management

### -ARCHITECTURAL PLANNING DIVISION

**Basic education and research on architectural design:**

History and Theory of Architecture, Theory of Historical Environments, Planning Theory of Built Environment, Urban and Architectural Safety Planning

### -ENGINEERING OF BUILDING STRUCTURES DIVISION

**Education and research on the safety of buildings subjected to earthquakes, improvement of building materials and structural systems:**

Structural Performance Engineering, Structural Control in Dynamics, Structural Systems Engineering

### -ARCHITECTURAL ENVIRONMENTAL ENGINEERING DIVISION

**Education and research on analysis, control, and planning of architectural and urban environments:**

Planning of Acoustical and Lighting Environments, Thermal Environmental Planning, Planning of Urban Environment and M & E Services





Measurement of the thermal environment



Exercise in drawing and painting



Listening test in an anechoic room

## MESSAGES FROM FOREIGN STUDENTS STUDYING IN THE DEPARTMENT



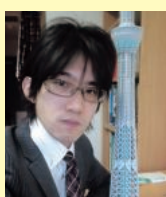
### ABDUL MUNIR [from Indonesia]

It is a great educational experience for me to be a graduate student at Kobe University, which has very well organized academic activities and very good official services. I enjoy the academic atmosphere on campus as well as the daily life in Japan, which is a beautiful country with generous and friendly people and rich cultural values. Thanks to Kobe University for this opportunity.



### FARAMARZ RAHIMINIA [from Iran]

I had always dreamed of continuing my education in Japan, which is a leader in the field of earthquake resisting structures. It is a very valuable experience for me to be involved as a Ph.D. candidate in the steel structure laboratory in the architectural department of Kobe University. I enjoy living in Japan with my family while developing my skills in the academic field.



### MIAO DA FU [from China]

I was interested in architecture before coming to Japan. I applied to the Department of Architecture at Kobe University, which has a long history and has produced many talented professionals. When I entered, I sometimes became nervous. However, I have had a happy school life thanks to friendly Japanese students and kind teachers and staff. In the specialized subjects, I learned new knowledge, and It was very stimulating. I'll never forget how pleased I was when I designed my first architectural presentation with my ideas. At the same time, the experiments and simulations shown in the classes on structural and environmental engineering were very interesting. After I joined a laboratory in my fourth year, I took part in many

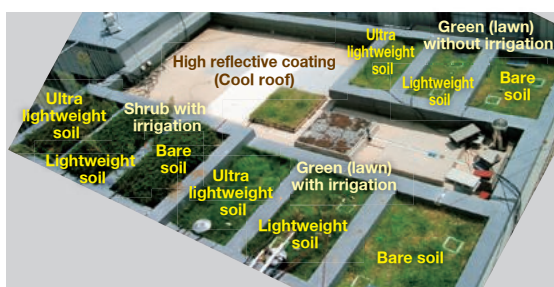
seminars, discussions, and investigations, and deepened my academic interests. Of course, there is more than studying. Kobe University has many chances for interacting with foreign students. I've made many friends. This is a very nurturing environment to expand one's perspective through touching other cultures. My four years in Kobe were incredible. I entered the Master's course at Kobe University to increase my technical knowledge. Interesting classes, charming professors, and above all, fun architecture that can shape your dreams ... Won't you realize your dreams in the Department of Architecture at Kobe University?

## RESEARCH TOPICS



### Experiment on semi-rigid composite connection

(Study on composite structures by Assoc. Prof. Ohtani)



### Experimental roof for surface cover technology in an urban structure at Kobe University

(Study on urban thermal environment by Assoc. Prof. Takebayashi)



### Temporary housing model made of bamboo and plaster in a disaster area of the Central Java Earthquake

(Study on reconstruction processes by the Environmental Planning & Design Lab)

# CIVIL ENGINEERING

NEW CIVIL ENGINEERING TOWARDS SAFETY AND SYMBIOSIS OF URBAN AND REGIONAL SYSTEMS



## PHILOSOPHY

**C**ivil Engineering aims at creating a safe society in harmony with the environment, through the construction and preservation of infrastructure. Civil engineering education help us create urban and regional environments safe from natural and social disasters, and live in symbiosis with nature, through preservation,

lifetime management and revival of city facilities. We admit students who are ambitious to become the pillars of public service needed in our society, and we develop them into individuals with broad academic backgrounds, specialized knowledge, and high-level practical skills.

## EDUCATIONAL CONTENT

**S**olving safety and environmental problems in urban and regional areas is a common interest worldwide. "New civil engineering in the 21st century" focuses on various new engineering aspects while maintaining a well-built and established base of civil engineering. The program also emphasizes public participation and international cooperation. Courses offered to undergraduate, master's and doctoral students give them deep knowledge and understanding of the safety and environmental aspects of modern

society. The study area covers a wide range in the fields of disaster prevention and mitigation, environmental assessment and protection, infrastructure planning and management, and geotechnical and structural designs. Students who aspire to make their career in public services at global or local levels are welcome. Currently, we have more than 10 overseas students from China, Korea, India, and other countries.

## CONSTITUTION

**C**ivil engineering is a diverse academic field that has supported civil society ever since Roman times. In the core of the curriculum are the civil engineering subjects, complemented by subjects dealing with environmental considerations, the status quo of public facilities reflecting public opinion, as well as the internationalization of design codes and standards.

The Department of Civil Engineering consists of the Human Safety and Security Engineering section and the

Environmental Symbiosis Engineering section. The Human Safety and Security Engineering section does teaching and research about urban safety against natural disasters and social disasters such as terrorism and accidents. The Environmental Symbiosis Engineering section engages in teaching and research about the creation of urban and regional environment living in symbiosis with nature, as well as the preservation, lifetime management, and renewal of city facilities.

## ROLE OF PUBLIC SERVICE

- 1) Safety and security: Save us from natural disasters such as earthquakes and floods and provide safe and secure living environment.
- 2) Natural symbiosis: Improve infrastructure symphonic with natural environment and pass on a good global environment to future generations.
- 3) Community collaboration: Create urban and regional space with great individuality, involving public comments.
- 4) International cooperation: Support the development of overseas societies with infrastructure improvement and disaster relief.





Field survey for saving human lives from natural disaster

## SAFETY

Risk management seminar for preventing damage spreading



NATURE

SOCIETY



Field survey for designing environmentally balanced life

## SYMBIOSIS



Design exercise on an urban system with minimized load to earth environment

## MESSAGES FROM AN OVERSEAS STUDENT



### MAURO RICARDO SIMÃO [Doctoral student from Mozambique, 2014-2017]

First and foremost, allow me to greet and wish a warm welcome to all those students who have selected and been accepted to Kobe University. You are in for a life changing experience. Kobe University is an exciting and challenging environment to study in, whether for a degree or research purposes. This is specially the case in the Faculty of Engineering/Graduate School of Engineering where I belong. In my department, research and lectures are conducted in both Japanese and English, making the multilingual environment much richer. I am sure that one of the biggest concerns prospective students have before applying to study in Japan is not having prior knowledge of Japanese

certainly, that was my case. But let me assure you that there is a whole support structure that has been created to accommodate students, especially while they focus on learning the language in the many available language programs at Kobe University. Furthermore, by studying at this great university, one has the opportunity to live in the city of Kobe. It is a very multi-cultural and vibrant city filled with great sight-seeing spots. Kobe is, in my opinion, one of the most interesting cities in Japan to live in, with its mixture of old and new, culture and history, people and places. With that, it is my privilege to welcome you to the city of Kobe, Kobe University, and wish you a great time.

## RESEARCH TOPIC(EARTHQUAKE DISASTER MITIGATION ENGINEERING)

The engineering community has long worked to build safe and reliable lifeline systems, that is, those systems necessary to provide electric power, natural gas, water and wastewater, and transportation facilities and services that are essential to the well being of the community they seek to serve. Providing lifeline system function is especially important in assisting rapid recovery following natural hazards. Engineering approaches to limiting damage to lifeline systems from natural hazards have developed specifically for individual natural hazards and individual types of lifeline systems.

The Division of Earthquake Disaster Mitigation Engineering has contributed to identifying lifeline system

risks and implementing measures to improve earthquake performance of the systems. In this regard, several activities are carried out as follows: field surveys on seismic damage to lifeline systems during each earthquake; elaboration and verification of underground conduit analysis; development of models and methods for reliability analysis of large networks and systems for business interruption analysis; emphasis on measures for lifesaving systems; and implementation of an overall seismic mitigation evaluation considering disaster prevention investment in community, economy, and social activity according to the function damage of lifelines.



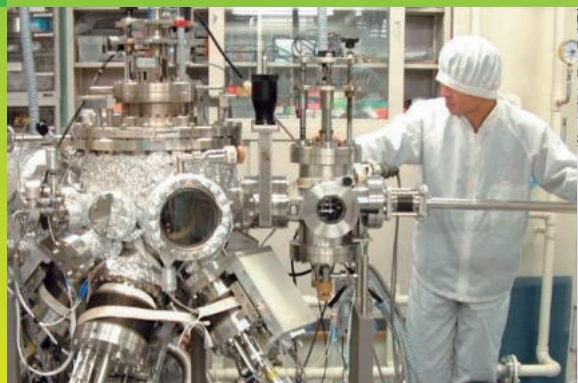
Field surveys on lifeline damages



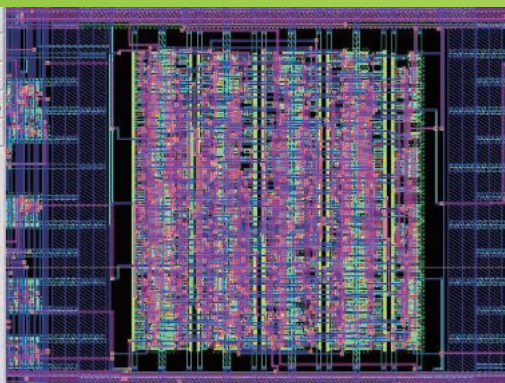
Seismic mitigation prioritization in lifeline systems

# ELECTRICAL AND ELECTRONIC ENGINEERING

HARDWARE AND SOFTWARE ENGINEERS/RESEARCHERS FOR A HIGH INFORMATION SOCIETY



Sputter deposition system



LSI layout design of CAD system



Experimental arrangement for new materials

## CONCEPT

In recent years, electrical and electronic engineering/technology has been expanding with the rapid advancement in all engineering disciplines, which inherently embrace an ever-widening range of academic and professional programs. From a global point of view, the Department of Electrical and Electronic

Engineering offers the balanced interdisciplinary core subjects and studies on both education and research in the state-of-the-art scientific and technological fields of Physical Electronics, Computer and Information Engineering, and Functional Thin-Film Engineering.

## EDUCATION

The characterized and professionalized education and research core courses in the Department of Electrical and Electronic Engineering are specifically classified into two balanced academic divisions Physical Electronics and Computer and Information Engineering. The Division of Physical Electronics offers scientific and technological education as well as interdisciplinary and

frontier research project works, which are mainly concerned with the sectionalized major education and research programs. The Division of Computer and Information offers scientific and technological education as well as sophisticated hardware and software research project works associated with the sectionalized education and research programs.

## STRUCTURE

The Physical Electronics Division covers specialized education and sectionalized research on electromagnetic field and waves, solid-state physical engineering, quantum physics and electronics, electrical and electronic material science, semiconductor electronics, sensor devices, nanoelectronics, photonic devices, surface physics and electronics, super-conducting physics and electronics, optics and optoelectronics, high-energy physics, plasma electronics, and bio-science and engineering in addition to such fundamentals as applied mathematics, physics, chemistry and mechanics. The Computer and Information Engineering

Division includes specialized education and sectionalized research on electric and electronic circuit theory, integrated circuit design and systems, computer and communication systems, wearable computing, ubiquitous and ad-hoc networks, information networks, information transmission, information theory, coding theory, data compression, digital broadcasting, information and network security, data structures and algorithms, graph theory, software design, image processing, control engineering, optimization theory, pattern recognition, fuzzy theory and neural networks, and intelligent machines.

## INTERNATIONAL PROGRAM

According to the academic exchange agreements with overseas universities and institutions, our department conducts intensive exchanges for education and research. Every year, foreign students from Korea,

Malaysia, etc. enrich the academic and international environment on campus. Some labs cooperate with research institutions of the USA, Germany, New Zealand, Korea, England, France, etc.





Face recognition system



Fusion direct power generation simulator

## MESSAGE FROM AN INTERNATIONAL STUDENT



### FADIAH ADLINA BINTI M. GHAZALI [from Malaysia]

It has been a great opportunity to earn my Bachelor's and Master's degree at Kobe University with the guidance and help of dedicated and highly acclaimed professors in the material mesoscopic laboratory and EE department. Pursuing my research here in plasmonics has given me the chance to use high-tech laboratory facilities and attend international conferences, which has definitely expanded my horizon

at so many levels. It is a wonderful experience to mix with Japanese students and learn the language and interesting culture. Kobe University has by far the most beautiful location beneath Mt. Rokko and seaview of the port of Kobe. Kobe has many foreigners and is not too crowded. I think Kobe is one of the best cities in Japan to live in.

## RESEARCH TOPIC: AI AND BIG DATA ANALYSIS

(DIVISION OF COMPUTER AND INFORMATION ENGINEERING, INTELLIGENT LEARNING THEORY GROUP)

**D**ata is the oil of the 21st century. In addition to digital platforms such as GAFA, many companies/organizations have developed their own ICT technologies to generate, collect and monetize various digital information in the name of digital transformation. With the aim of improving people's lives and security, our laboratory is conducting the following research projects on big data analysis using machine learning:

- 1) Development of machine learning models for privacy-preserving data mining using homomorphic encryption,
  - 2) Machine learning approaches to cybersecurity to enable global monitoring of cyberattacks, including cyberattack detection/classification, malicious website/JavaScript exploration and darknet traffic analysis (see Fig. 1),
  - 3) Financial document analysis to forecast market trends using machine learning,
  - 4) Image sensing methods to observe growth states of plants for smart agriculture (see Fig. 2),
  - 5) Visualization methods for high-dimensional big data and its applications.
- Our laboratory is committed to contributing towards the achievement of global SDGs through big data analysis and AI.

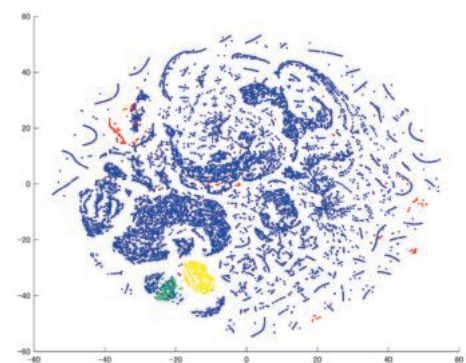


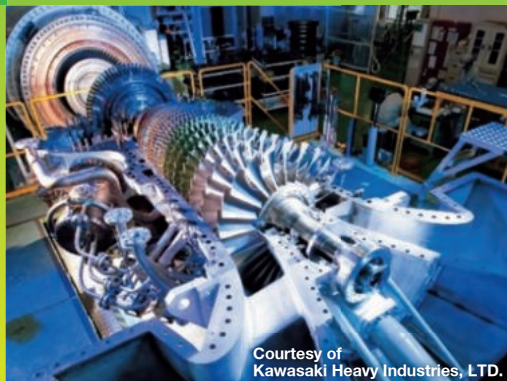
Figure 1 t-SNE visualization of scanning attacks being conducted on the internet.



Figure 2 An example of soybean flower detection results.

# MECHANICAL ENGINEERING

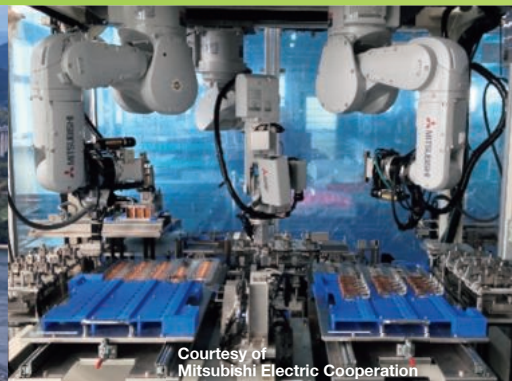
CHALLENGES TO BREAKTHROUGH OF "MACHINES" TO SUPPORT A SUSTAINABLE SOCIETY



Courtesy of  
Kawasaki Heavy Industries, LTD.



Social infrastructure(Great Seto Bridge)



Courtesy of  
Mitsubishi Electric Cooperation

Next-generation production system  
(robotic production cell)

## Examples of "machines" that support a sustainable society

### CONCEPT

Since the industrial revolution of the 18th century, "machines" have advanced greatly to become widespread across the globe. They have become the driving force of industrial development, supporting our societies across various areas. Nowadays, the concept of "machine" is expanding further, together with technological advances such as information technology, and fusing with related fields such as electronics, bioengineering, and medicine. This includes intelligent machines and robots, information devices connected to networks, and machines functioning in extreme or micro environments that were previously unimaginable.

Mechanical engineering is a basic discipline that has supported this evolution of "machines", and the various technologies related to "machines" and "manufacturing" are the culmination of the efforts devised by many engineers and researchers majoring in mechanical engineering. However, the development of industries through mass production and mass consumption has also caused global energy issues and environmental problems. Therefore, mechanical engineers now play a vital role in contributing towards the realization of a "sustainable society", which is safe and secure and has less impact on the environment. They must also aim to solve these related issues from a global perspective, considering the social influence of science and technology.

The Department of Mechanical Engineering keeps challenge towards the breakthrough of "machines" that drive new technological innovations capable of supporting such a "sustainable society". We continue to cultivate mechanical engineers and researchers who can respond to the demands of future society.

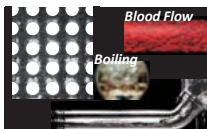


### STRUCTURE AND DIVISIONS

The department of Mechanical Engineering was established in 1921, one of the oldest departments in the University. It produces many leading engineers in mechanical engineering. The department has four divisions: Heat Transfer and Fluid Engineering, Materials Physics and Mechanics, System Design, and Innovative Materials and Nano Engineering. Research programs are offered in 11 fields.

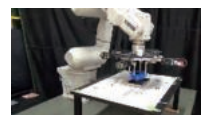
#### -DIVISION OF HEAT TRANSFER AND FLUID ENGINEERING

Towards realization of sustainable society, complex phenomena with heat and mass transfer in fluid systems in human body, energy systems including power and refrigerating systems, natural environment, and so on, are being investigated theoretically, experimentally, and numerically.



#### -DIVISION OF SYSTEM DESIGN

The mission of this division is to establish engineering solutions required for developing active but sustainable next generation social systems from the viewpoints of system design. Towards this goal, we conduct education and research on system analysis and design, intelligent robots, advanced devices, and next-generation manufacturing technologies that cover a wide range of phenomena at micro and macro levels.



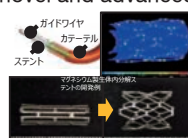
#### -DIVISION OF MATERIALS PHYSICS AND MECHANICS

The mission of this division is to promote research and education of mechanical and physical properties of materials through analytical, numerical, and experimental evaluation of structures and machine components. Formation of advanced materials is also studied in this division.



#### -DIVISION OF INNOVATIVE MATERIALS AND NANO ENGINEERING

The mission of this division is to develop novel and advanced functional mechanical systems for a sustainable next generation society from a viewpoint of nano/micro to macro scale levels; for example, developments of body implantable mechanical systems, wearable sensors for health monitoring.





## EDUCATION

**T**he goal of education in the Department of Mechanical Engineering is to train students to become engineers or researchers who possess originality, application skills, and flexibility based on a solid foundation of experience-backed basic knowledge. For this purpose, the undergraduate course curriculum incorporates not only lectures on specialized basic subjects and specialized subjects but also extensive practical training, experiments, and exercises that effectively supplement the lectures.

All graduate students in the master's program will be members of one of the laboratories in the department, and will conduct their own research in a specific research field. We cultivate the advanced research capabilities of the students through the conduction of actual cutting edge research, where the faculty and students face off against the unknown issues together, questioning and discussing issues and ideas on an equal footing.



Mechanical drawing



Factory training



Creative machine design projects 1 & 2



Research & experiment



Discussion



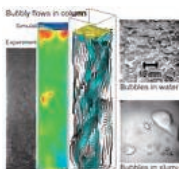
Presentation

## RESEARCH TOPICS

### -BUBBLY FLOW IN BUBBLE COLUMN

(Multiphase Fluid Dynamics Lab./Div. of Heat Transfer and Fluid Engineering)

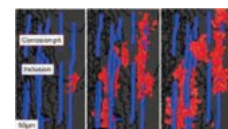
Bubble column reactors, in which complex bubbly flows are formed, have been widely used in various practical systems. Experiments and numerical simulations have been carried out in this lab to understand the complex flow structure in detail. Effects of fine particles, which drastically change the bubble size distribution in slurry bubble columns, are also being investigated.



### -OBSERVING FATIGUE CRACK INITIATION PROCESS BY ULTRA-BRIGHT X-RAY

(Structural Safety Evaluation Lab./Div. of Material Physics and Mechanics)

The figure shows an example of CT imaging showing corrosion fatigue crack initiation process in high-strength aluminum alloy. This image was obtained by ultra-bright synchrotron radiation X-ray, and clearly shows that corrosion pit (indicated by red) is formed around inclusion (blue), and grew along it beneath the surface.



### -MACHINING PARTS WITH COMPLEX SHAPES WITH HIGH ACCURACY

(Advanced Manufacturing Systems Lab./Div. of System Design)

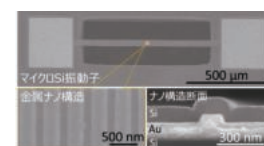
Machine tool technologies including mechanical components, motion control technologies and advanced industrial software technologies play key roles in the industries. Advanced manufacturing systems laboratory developed the high-speed and high-precision machining technology for jet engine parts based on the modeling and control technologies for multi-axis controlled machining centers.



### -REALIZING NANO-SCALE SENSORS

(Nano Electro Mechanical Systems Lab./ Div. of Innovative Materials and Nano Engineering)

This division promotes advanced researches on optical sensors used for high-capacity information communication and analysis of biomolecules such as a detection of single molecule DNA, which integrate metal nanostructures on micromechanical structures. Nano and microscale manufacturing technologies can realize advanced functional sensors.



## MESSAGE FROM AN INTERNATIONAL STUDENT



### Nor Elora [Undergraduate student from Malaysia (April 2014-March 2018)]

Kobe University is where my dream was fulfilled. To be able to study here in Kobe University has been the greatest experience in my life. Now, I am an undergraduate student in my fourth year. I can say studying here has been a humbling journey. The teachers here are not only rich in knowledge but also kind, helpful, and down to earth. The community here is very friendly and caring too. Kobe

University also offers tip top facilities where you can enjoy studying here with a peace of mind. Here in Kobe University, I was able to meet a lot of people and experience cultural exchange. When I graduate from this university, I will be returning back to Malaysia with a great opportunity of applying this invaluable experience and knowledge that I gained from here. (This message was given in 2018.)

# CHEMICAL SCIENCE AND ENGINEER

HELPING THE DREAMS OF THE 21ST CENTURY COME TRUE

## CONCEPT

**T**he overall mission of the Department of Chemical Science and Engineering is to foster the next generation of researchers and engineers in chemistry-related fields on a global scale by education and research to meet the needs of industry and society in general. The research and educational activities in our department

cover the fields of fundamental chemical science on the microscopic and molecular level, the addition of specific functionality to chemicals and materials, engineering applications of biofunctional materials, and process development in industrial scale material production.

## EDUCATION

**I**n recent years, significant technological developments and innovations have resulted in rapid and marked changes in the way highly functionalized chemicals and materials are produced, as well as in the chemicals/materials themselves. Thus, it is essential for the future chemical researcher not only to have a sound fundamental knowledge of chemistry, physics, and biology from an engineering viewpoint, but also to have the skills and ability to apply this knowledge

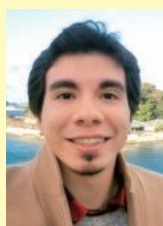
with respect to a wide range of chemical products and processes, to be able to analyze and synthesize chemicals, and to design environmentally friendly chemical and biochemical systems. In this vein, the department's mission is to provide students with the skills required to satisfy the needs of the chemical industry and society in general as chemical researchers and engineers, with an emphasis on fundamental science, analysis, applications, and creativity.

## ORGANIZATION

**O**ur department consists of two divisions: The Division of Applied Chemistry and the Division of Chemical Engineering. Research/education within the Division of Applied Chemistry includes the generation of functionality of chemicals and materials and elucidation of mechanisms involved, as well as the development of techniques for new material production from atomic/molecular levels to nano/meso/macro levels to attain a wide range of functionality on a macroscopic level by the accumulation of molecules into novel materials.

Research/education in the Division of Chemical Engineering includes the development of useful materials and reaction catalysis, establishment of controlled processes involving reaction and mass transfer and development of new production processes based on the clarification of interaction between molecules, functionality of biomaterials and energy and mass transport phenomena. The ultimate goal is the development of new production processes with both high efficiency of material and energy and low environmental impact.

## MESSAGES FROM INTERNATIONAL STUDENTS



### DANIEL ALEJANDRO ALFARO SAYES [from El Salvador]

First of all, I would like to give a warm welcome to all the new students of Kobe University. I am sure that your time studying in this prestigious university will be beneficial for your life and your career as it has been for me. I am currently a second year master's degree student.

In Kobe university you will receive a highly specialized level of education in a multicultural environment that will allow you to specialize in your area of interest and perform the research that is most relevant to you, you will count with the support of highly skilled and dependable professors during your studies, and you will possess all the facilities and equipment necessary to perform your research in the most adequate way.

Most of the courses in the Graduate School of Engineering are presented by professors capable of explaining the material in both English and Japanese, so you do not need to worry if your Japanese language ability is not so advanced, Kobe University also offers Japanese classes for international students, you can take part in these classes while studying your master or doctor degree without any problem.

Kobe university is located in the city of Kobe which is one of the most famous and multicultural cities in Japan, surrounded by both beautiful mountains and sea, you can also try exquisite delicacies such as Kobe beef that is renowned worldwide.



### NURLINA BINTI AZMI [from Malaysia]

I first enrolled in Kobe University's Faculty of Engineering in 2013 as an undergraduate student in the Chemical Science and Engineering course, and later further my studies in Masters degree programme which I successfully graduated in March 2019. Studying in Kobe University as undergraduate student at first was quite challenging because of the language barriers. Fortunately, the lecturers were very understanding towards international students. They tried their best to help us to understand the class better. During graduate studies, Chemical Science and Engineering course here offers classes in English, which really help international students whom are not yet fluent in Japanese. Even for classes that are not fully in English, lecturers are ready to help you so don't be shy to ask for help. I was also given chances to attend academic conferences not

only in Japan but also in other countries during my time as graduate student. Kobe University also host conferences where many great researchers gather to share their research findings. Therefore, you will get many chances to increase your knowledge in selected fields.

Furthermore, in 2016, Kobe University opened a new cafeteria near the Centre for International Education, which cater for muslim students where different halal meals are served every day. Besides that, the cafeteria is also one of the places where international students gather. So, you can have many opportunities to interact with people from other countries. I have gained many useful knowledges and memorable experiences during my time in Kobe University and definitely recommend Kobe University to others.



## DIVISION OF APPLIED CHEMISTRY

### CREATIVE MATERIALS CHEMISTRY

Research Group	Keywords
Organic Reactions	Transition metal catalysis, Polymer syntheses, Advanced organic materials
Inorganic Materials Chemistry	Inorganic materials, Electrochemistry, Materials for energy conversion, Highly concentrated solution, Molten salt chemistry, Liquid phase deposition, Relaxative auto-dispersion, Solid-liquid coexisting systems, Hetero-phase effect, Nanomaterials
Synthetic Organic Chemistry	Heterocyclic chemistry, Fluorine chemistry, Biologically active substances, Functional materials, Exploratory research on medicines and agrochemicals
Soft Matter Interface	Polymer synthesis, Soft matter, Polymer particles, Interface, Heterogeneous polymerization

### SMART MATERIALS CHEMISTRY

Research Group	Keywords
Smart Polymer Chemistry	Polymer property, Polymer structure, Polymer surface and interface, Composite, Adhesion
Material Physical Chemistry	Material physical chemistry, Thin film growth, Organic electronics and optics, Dipole engineering, Molecular sensor and actuators, Molecular nanotechnology

### FUNCTIONAL MATERIALS CHEMISTRY

Research Group	Keywords
Tailor-made Materials Chemistry	Molecular recognition, Functional gel, Polymer particles, Molecular imprinting, Biosensors
Functional Analytical Chemistry	Inorganic polymer chemistry, Inorganic phosphates, Inorganic energy chemistry, Environmental analytical chemistry
Biofunctional Materials Chemistry	Biofunctional materials, Drug delivery system, Cell/tissue engineering, Biomaterials

## DIVISION OF CHEMICAL ENGINEERING

### SEPARATION AND REACTION ENGINEERING

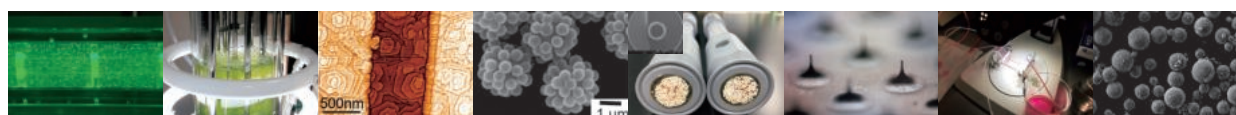
Research Group	Keywords
Membrane Engineering	Membrane separation, Separation based on reaction and diffusion, Control of microporous structure, Water treatment, Gas separation
Catalysis and Catalytic Reaction Engineering	Catalyst, Catalytic reaction engineering, Selective oxidation, Selective reduction, Surface science, Material science, Photocatalyst, Photocatalysis, Energy conversion, Green chemistry
Material-surface Engineering	Interface, Surface functionalization, Surfactant, Polymer, Biomolecule

### PROCESS ENGINEERING

Research Group	Keywords
Transport Science and Engineering	Process intensification, Process dynamics, Reactor, Functional film
Fluid and Particle Engineering	Rheology, Complex fluid, Latent heat transportation, Drag reduction
Drying Process Engineering	Coating drying, Drying model, Material-temperature change method, Microwave drying

### BIOCHEMICAL ENGINEERING

Research Group	Keywords
Bioprocess Engineering	Bioprocess, Bioreactor, Cell culture engineering, Recombinant protein production, Bioseparation
Bioproduction Engineering	Bioproduction, Biorefinery, Synthetic bioengineering, Protein engineering, Nanobio technology



# COMPUTER SCIENCE AND SYSTEMS

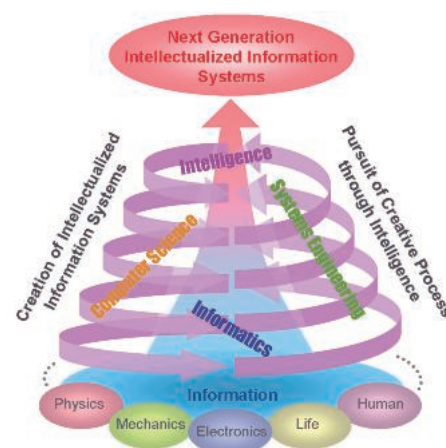
REALIZATION OF INTELLECTUALIZED NOVEL INFORMATION SYSTEMS TOWARD AN ACTUALIZATION OF CREATIVE



Computer and Systems Laboratory and Practice

## CONCEPT

The Department of Computer Science and Systems Engineering is devoted to such themes as the "pursuit of creative process through intelligence" and "creation of the next generation of intellectualized information systems." The department aims at one of the newest academic disciplines by integrating not only the fields of computer science and information technology, but also various scientific and engineering fields including electronics, mechanical engineering, life science, social science, and so on. The multi-disciplinary nature of computer science and systems engineering offers an exciting challenge for students thinking of embarking on a career in almost any scientific and engineering field or



information technology field in an advanced and more computerized society.

## EDUCATION

The course structure aims at the wide and deep exploration of education and research relating to computer science and systems engineering. The undergraduate program structure is department's carefully designed for students to study multi-disciplinary major courses as well as liberal arts. Freshman students start fundamental courses of computer science and systems engineering, such as mathematics, physics, logic circuits, and computer engineering. Sophomore students study both the fundamental and advanced courses including programming languages, spectrum analysis, and system analysis. Junior students mainly take advanced classes

such as database systems, sensing technology, and robotics. All senior students are engaged in research projects. Four-year Bachelor's degrees are awarded to undergraduate students. With respect to this department, a Graduate School of System Informatics was established in 2010 with three departments. Master's and doctoral degrees are awarded to students who have successfully completed the required subjects of an authorized graduate program. We have accepted many foreign students and young researchers from more than 20 countries around the world.

## MESSAGE FROM AN INTERNATIONAL STUDENT



### Nikhanbayev Nursultan [Doctoral Course]

Greetings! I am Nikhanbayev Nursultan, from Kazakhstan, PhD student at Kobe University, Graduate School of System Informatics. After getting a bachelor's in Kazakhstan, I got an opportunity to study at Kobe University, and it was a life-changing experience. I came to Japan in 2015, without any Japanese language skills. Kobe university provided intensive Japanese language courses, which helped me a lot not only to understand the language, but also to get a closer look at the unique Japanese culture. Later on, I enrolled in

the master course program and successfully graduated in 2018. Currently, I am doing research on the recent concept of super-smart society (Society 5.0) to create a theoretical background of multiscale modeling for social simulation. Kobe university offers a lot of research opportunities that help me to do the necessary progress in our mission of extending the boundaries of human knowledge. In addition, the guidance and wisdom of highly qualified professors supported me a lot to overcome both research-related and daily life difficulties. I strongly believe that Kobe university is the right place where one can get the necessary knowledge and experience to succeed in his/her future endeavors.





## STRUCTURE AND DIVISIONS

### -SYSTEMS SCIENCE

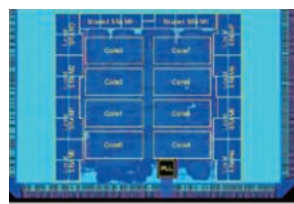
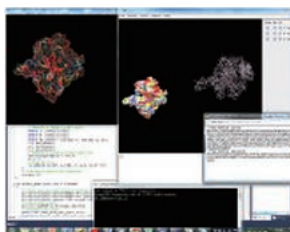
provides the student with a systems approach and problem-solving skills for effectively practicing analysis and synthesis, with a focus on large-scale complex systems, and further explores and integrates the respective departmental fields.

2 main divisions & 1 collaborative program

- Fundamentals of Systems Science
- Innovation of Systems Science
- Applied Robot Science (Mitsubishi Electric)

Students: 65 (Master course), 9 (Ph. D course)

Prof. 8 (10), Assoc. Prof. 7 (8), Ass. Prof. 3 (4)



### -INFORMATION SCIENCE

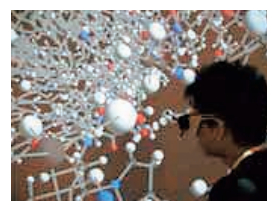
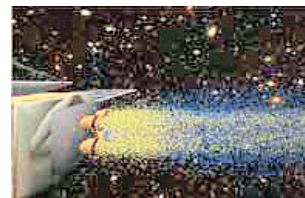
pursues the new academic fields of information science and technology contributing to an advanced information society and presents information technology that applies to information systems combining computers and networks, content media, and intelligence.

2 main divisions & 2 collaborative programs

- Foundation of Information Sciences
- Intelligent Informatics
- Kansei and Media Art (ATR)
- Integrated Intelligence (RIKEN AIP)

Students: 61 (Master course), 16 (Ph. D course)

Prof. 9 (11), Assoc. Prof. 8 (9), Ass. Prof. 3 (5)



### -COMPUTATIONAL SCIENCE

promotes research of the basics of computational science, such as mathematical modeling, simulation, visualization, and the application using ultra-high-speed, massively parallel systems.

2 main divisions & 2 collaborative programs

- Fundamentals of Computational Science
- Innovation of Computational Science
- Applied Computational Science (JAMSTEC)
- Large-scale Computational Science (RIKEN AICS)

Students: 63 (Master course), 15 (Ph. D course)

Prof. 8 (18), Assoc. Prof. 6 (11), Ass. Prof. 3 (8)

\*Information about the Graduate of System Informatics can be found on the following homepage: <http://www.csi.kobe-u.ac.jp>

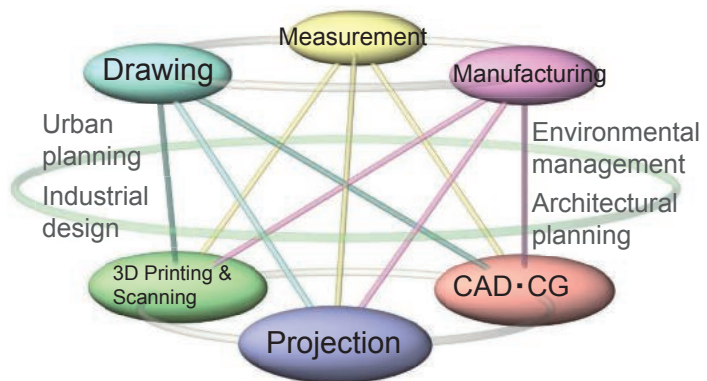
# ASSOCIATED RESEARCH CENTERS

## Associated Research Centers

The following seven research centers are affiliated with the Graduate School of Engineering. Serving as bases for cooperation with the Graduate School of Engineering, these centers aim to develop industry-university cooperation and also promote cutting-edge research in interdisciplinary areas.

### Graphics Literacy Education and Research Center

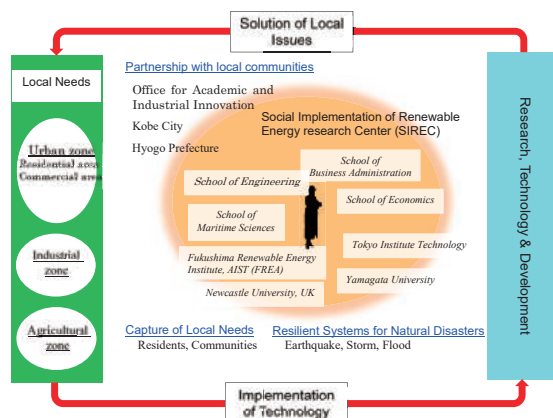
The center focuses on advanced education and research encompassing multiscale engineering design literacy for urban and architectural planning, industrial design and energy flow design, including a wide variety of disciplines from large to microscopic scale. The center also conducts education and research activities related to basic studies for design such as aesthetics and graphics sciences. Through these activities the center contributes to human resource development by cultivating students with aesthetic perspectives in addition to engineering design skills.



### Social Implementation of Renewable Energy research Center (SIREC)

Worldwide environmental deterioration due to global warming is becoming a reality, and it is paramount that energy creation and utilization systems that do not emit CO<sub>2</sub> are developed and implemented into society. This is not merely a matter of developing each elemental technology, but also requires that the problems encountered when implementing in the real world; such as those regarding the practical usage of renewable energy, regional characteristics, conversion of renewable energy to chemical energy for storage, transportation to energy consuming areas, etc., should be solved and optimized as a whole. Renewable energies such as sunlight and wind are converted into electric power and then into chemical energy, hydrogen. It is widely expected that hydrogen generation by direct decomposition via photo-catalysis using sunlight will be utilized in the future. The key to the success or failure of renewable energy

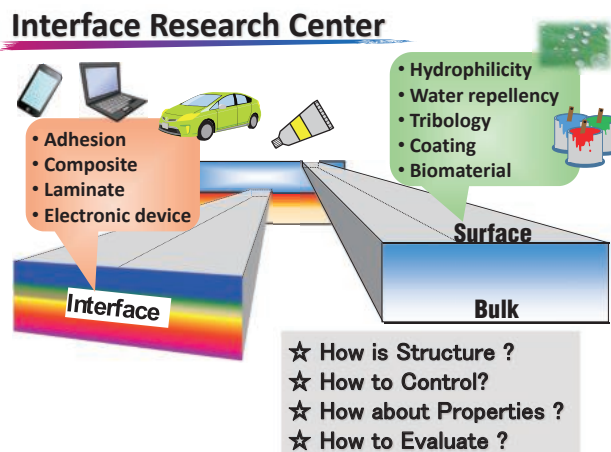
utilization is the efficiency of hydrogen production and the reconverted energy carrier material. In Japan, where many natural disasters occur, the resilience of the entire system to disasters is also an important issue to be considered. With the aim of socially implementing renewable energy, our center assumes five main strategies, (1) optimization of energy carrier mutual conversion, (2) optimization of energy storage and transportation, (3) community implementation design, (4) resilience to natural disasters, (5) standardization of elemental technologies. In addition, we are using *Kobe University's Strengths* as a comprehensive university to promote information transmission and empirical research using model cases.





## Interface Research Center

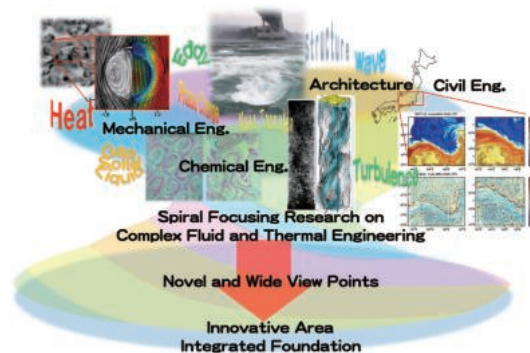
In the fields of nanotechnology and biotechnology, all the interfacial phenomena control functional properties of materials themselves. Strategies of manufacturing based on interface are in high demand. In this center, research teams are organized across various education and research fields in order to research interfaces, develop fundamental research on interfacial phenomena, and provide research seeds for next-generation manufacturing. In addition, researchers in the fields of Chemistry, Mechanical Engineering and Electrical & Electronic Engineering cooperate with each other, reinvestigate from novel perspectives and establish frontier interfacial science and unconventional industrial-academia collaboration. This center encourages collaboration in manufacturing based on interfacial functional properties, removing barriers between industry and academia and connecting fundamental research with the seeds for manufacturing. We are actively involved in national research projects and collaborate with various companies. These national research projects include Grants-in Aid for Scientific Research, JST Strategic Basic Research Programs CREST, Cross-ministerial Strategic Innovation Promotion Program SIP, New Energy and Industrial Technology Development Organization NEDO, MITI·Innovative Structural Materials Association ISMA, and JST MIRAI Programs.



## Complex Fluid and Thermal Engineering Research Center (COFTEC)

Complex fluid and thermal phenomena coexist and are utilized in many industrial fields. They include multiphase flow containing gas, liquid and solid phases, viscoelastic fluid flow, complex flow with vortices, eddies, fluctuation and waves interacting with structures, thermo-fluid flow with chemical reaction, phase change and transport phenomena, and thermo-fluid control concerning the environment and human life. Since the phenomena are studied separately in each industrial field, knowledge of them is fragmented and technical. There is little comprehensive engineering knowledge from a multidisciplinary scientific viewpoint. COFTEC is a multidisciplinary research group covering a wide range of research fields, mainly in the Graduate School of Engineering. It aims to promote fundamental education and state-of-the-art research, and to create next-generation research fields by means of integration and comprehensive promotion of research on complex thermo-fluid phenomena in a wide range of engineering fields.

We take another look at the framework dividing research fields into the conventional engineering fields, i.e. Architecture, Civil Engineering, Mechanical Engineering and Chemical Engineering. By examining these divisions from new viewpoints, we create new research fields to build comprehensive engineering fundamentals on complex thermo-fluid dynamics. The purpose of COFTEC is to contribute to the construction of a next-generation sustainable society. Our researchers will achieve this by working together to create innovative technologies and novel seeds of academic-industrial collaborations.



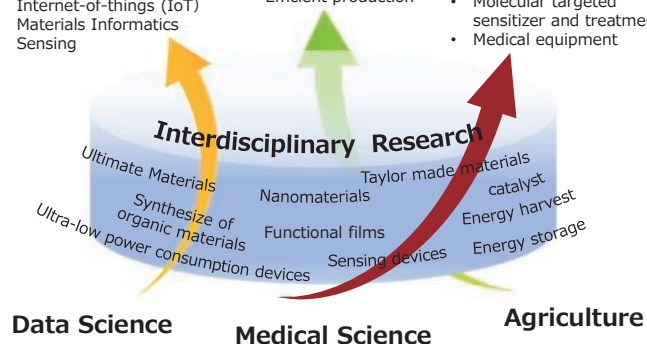
# ASSOCIATED RESEARCH CENTERS

## Research Center for Advanced Smart Materials

Technologies in current engineering can be effectively combined with different fields. The resulting novel academic fields can create new, advanced, highly functional smart materials. In particular, RCASM strongly promotes interdisciplinary research between engineering fields and data science, medical science, and agriculture. Materials are synthesized by controlling substances on an atomic level, creating new properties and qualities. The interface effects and quantum effects controlled by nano-scale hetero-structures produce unique, novel functions. For example, RCASM deals with mesoscopic and plasmonic materials, metal biomaterials, radiosensitizers, functional supramolecular hydrogel, and produces various devices for application such as photonic materials and devices, organic thin-film devices, MEMS micro-devices, and ultra-low-power analog and digital circuits. Additionally, we have started studying material design and synthesis based on artificial intelligent learning theory to create materials we have not yet encountered.

### Research Center for Advanced Smart Materials (RCASM)

- Interdisciplinary research of engineering mixed with data science, medical science, and agriculture
- Global open engineering
  - Artificial Intelligence (AI)
  - Internet-of-things (IoT)
  - Materials Informatics
  - Sensing
  - Bio-production
  - Bio-complex
  - Efficient production
  - Human adaptive devices
  - Biomaterials
  - Biocompatible materials
  - Molecular targeted sensitizer and treatment
  - Medical equipment



## Resilient Structure Research Center (ReSRC)

Huge earthquakes, mega typhoons and tsunami have high potential for damaging the human environment in the near future. To protect buildings, infrastructures and important facilities in urban areas against extreme disasters, the required countermeasure is not only damage reduction but also ensuring resilience in order to recover urban facilities' functions rapidly after the disasters. The Resilient Structure Research Center (ReSRC) of Kobe University has been operating since June 2016 to enhance urban resilience research from the structural engineering viewpoint. The Graduate School of Engineering at Kobe University has recently installed two kinds of high performance experimental apparatus to estimate the ultimate behavior of various kinds of structural elements: "Shaking table" and "High-speed actuator". ReSRC has a mission to maximize these research resources, to collaborate with many research counterparts in Japan and abroad, and to advance our activities on resilient structure research. Our research objectives are to embody a global standard for the performance evaluation of resilient structure systems/devices/designs and to propose a common international evaluation method through international collaborative research. ReSRC aims for advanced research outcomes that contribute to the urban formation of resilience and robustness against disasters.



Shaking table

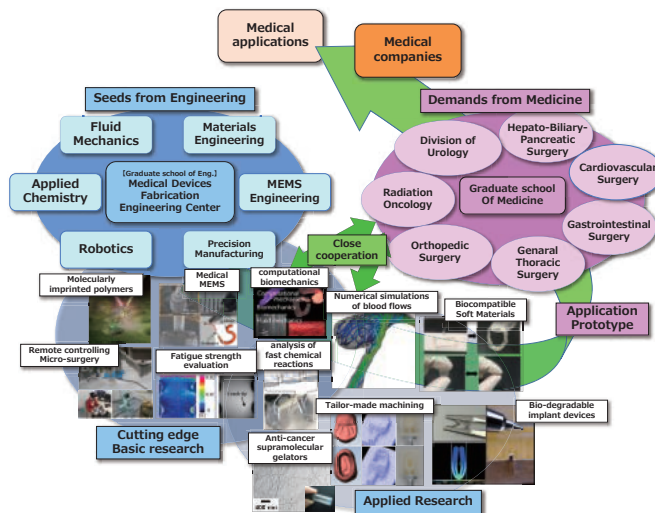


High-speed actuator



## Medical Device Fabrication Engineering Center

The Medical Device Fabrication Engineering Center (MeDFEC) aims to develop novel medical devices and systems for medical care. Developments pass through three stages: (i) cutting-edge basic research, (ii) applied research, and (iii) application prototype through close cooperation with medical doctors / researchers. MeDFEC is mainly composed of researchers from the Department of Mechanical Engineering and the Department of Chemical Science and Engineering. In order to monitor the direction of research and development, the Center cooperates



closely with researchers belonging to the Graduate School of Medicine, especially in the field of surgery and related areas. Individual researchers in this center have their own seeds based on mechanical engineering and chemical engineering, as shown in the diagram. From several seeds, cutting-edge research outcomes are introduced to the medical researchers, and then advance to the applied research stage to be adapted as a new medical device. The developed prototype is examined in vivo to check the safety requirements and effectiveness. Of course, the final goal is actual application of the individual research outcomes.

## Center for Resilient Design (CResD)

-Towards A Resilient Society-

A flexible city that can demonstrate resilience against disasters must be a livable city at the same time. In order to realize such a social environment, not only the physical environment that forms the urban space, but also an integrated perspective including people's behavior, norms, institutions, etc. are necessary. In order to show such a perspective, "design" is required to implement academic knowledge and research results. We will develop a method to implement various knowledge for achieving a safe and comfortable society that has been cultivated and accumulated at Kobe University into society through "design". For this reason, we collaborate with domestic and overseas institutions, establish a network for the realization of a safe and secure world from an international perspective, and establish a research base. This center also participate in "Multidisciplinary Integration for Resilience And Innovation (MIRAI)" research unit of Kobe University which is one of our university function enhancement project.

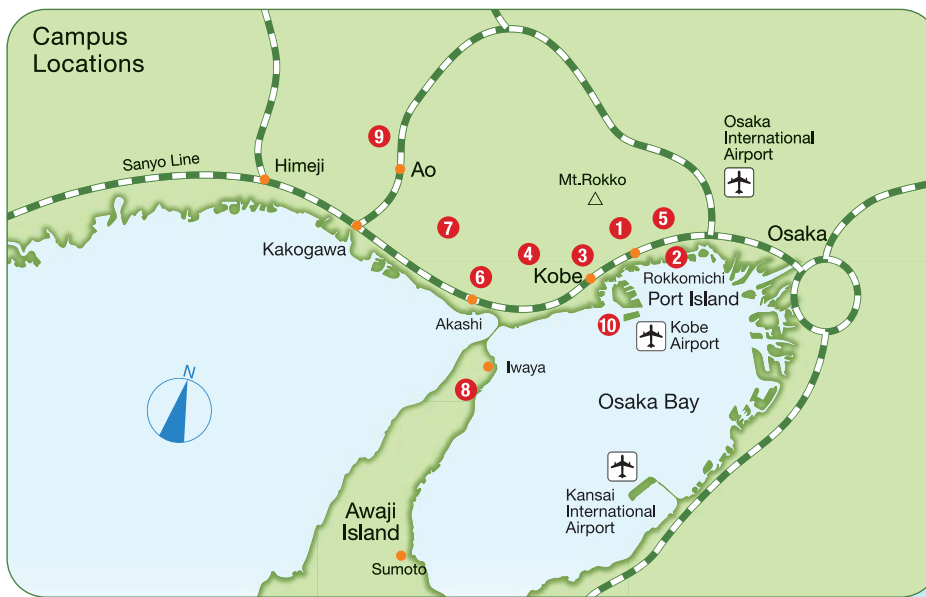


### Research Themes of Center for Resilient Design Kobe University

As a design center at international level, CResD aims at conceiving resilient urban society. It maintains experimental, practical, open and integrated studies in multidisciplinary ways in order to return research results to our societies.



# ACCESS



- 1 Rokkodai Campus
- 2 Fukae Campus
- 3 Kusunoki Campus
- 4 Myodani Campus
- 5 Sumiyoshi Elementary School, Sumiyoshi Junior High School
- 6 Akashi Elementary School, Akashi Junior High School, Kindergarten
- 7 School for Special Needs Education
- 8 Research Center for Inland Seas
- 9 Food Resources Education and Research Center
- 10 International Residence Business Incubation Center, Kobe Biotechnology Research and Human Resource Development Center



## Kobe City

The City of Kobe is located to the west and center on the main island of Japan. It is accessible by land, sea, and air to domestic and international locations. It takes 2 hours and 50 minutes to get to Tokyo by Shinkansen Bullet Train, and 1 hour and 20 minutes by plane. Within easy reach of Kobe, there are several famous cities with many historical sites and spots of interest, such as Himeji, Kyoto, Nara, and Osaka.

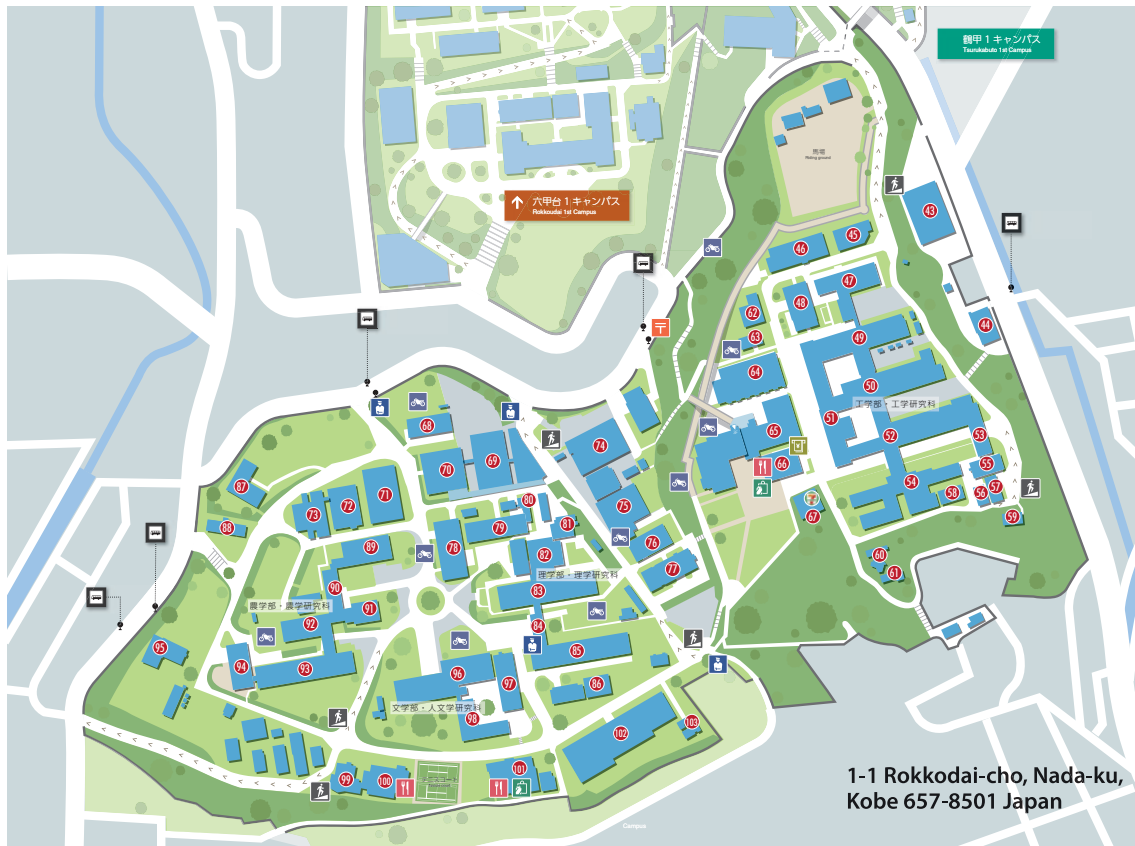
Ever since it was opened to the world, Kobe has developed as a cosmopolitan port city where people, goods, and information from around the globe are in constant motion. Now, Kobe has a population of 1.5

million including 45,000 foreign residents from as many as 115 different countries and is well known throughout Japan as being an “international city.” With a diverse population of foreign residents and the resulting facilities and amenities established by and for such foreign communities, Kobe is uniquely qualified to support a comfortably refined lifestyle for any individual from any country.

Sandwiched between Mt. Rokko in the north and the Inland Sea of Seto in the south, Kobe is endowed with an overall mild climate averaging 17.1C (62.8F) with four seasonal changes.







- 43 Research Center for Urban Safety and Security (Laboratory)
- 44 Research Center for Urban Safety and Security (Research Building)
- 45 Center for Supports to Research and Education Activities (Instrumental Analysis Division)
- 46 Information Science and Technology Center (Annex)
- 47 Faculty & Graduate School of Engineering - 5E, 5W, C4
- 48 Faculty & Graduate School of Engineering - LR
- 49 Faculty & Graduate School of Engineering - 4E, 4W, C3
- 50 Faculty & Graduate School of Engineering - 3E, 3W, C2
- 51 Faculty & Graduate School of Engineering - D1, D2
- 52 Faculty & Graduate School of Engineering - 2E, 2W, C1
- 53 Faculty & Graduate School of Engineering - B
- 54 Faculty & Graduate School of Engineering - 1E, 1W
- 55 Faculty & Graduate School of Engineering - A
- 56 Faculty & Graduate School of Engineering - Disaster Prevention Laboratory
- 57 Faculty & Graduate School of Engineering - Structural Elements Laboratory
- 58 Faculty & Graduate School of Engineering - Structural Dynamics Laboratory
- 59 Faculty & Graduate School of Engineering - Wind Tunnel Laboratory
- 60 Faculty & Graduate School of Engineering - Acoustics Laboratory
- 61 Faculty & Graduate School of Engineering - Psychoacoustics Laboratory
- 62 Faculty & Graduate School of Engineering - Manufacturing Technology Center
- 63 Faculty & Graduate School of Engineering - Biorefinery Center
- 64 Research Center for Advanced Membrane and Film Technology
- 65 Science and Technology Research Building 3
- 66 Canteen (T-BOX Cafeteria)
- 67 Faculty & Graduate School of Engineering - Campus Hall
- 68 Center for Collaborative Research and Technology Development
- 69 Science and Technology Research Building 2
- 70 Science and Technology Research Building 1
- 71 Science and Technology Research Building 4
- 72 Life-Science Laboratory
- 73 Center for Supports to Research and Education Activities (Radioisotope Division)
- 74 Administration Offices (Secretariat/ Medical Center for Student Health)
- 75 Library for Science and Technology
- 76 Information Science and Technology Center (Main Building)

- 77 Graduate School of System Informatics (Main Building)
- 78 Environmental Genomics Research Center & Biosignal Research Center
- 79 Faculty & Graduate School of Science - C
- 80 Center for Environmental Management
- 81 Central Research Laboratory (Shared Facilities)
- 82 Faculty & Graduate School of Science - Y, Z
- 83 Faculty & Graduate School of Science - B
- 84 Faculty & Graduate School of Science - X
- 85 Faculty & Graduate School of Science - A
- 86 Center for Supports to Research and Education Activities (Cryogenic Division)
- 87 Faculty of Agriculture & Graduate School of Agricultural Science - Agricultural Engineering Workshop
- 88 Faculty of Agriculture & Graduate School of Agricultural Science - Meat Processing Center
- 89 Faculty of Agriculture & Graduate School of Agricultural Science - A
- 90 Faculty of Agriculture & Graduate School of Agricultural Science - B

- 91 Faculty of Agriculture & Graduate School of Agricultural Science - C
- 92 Faculty of Agriculture & Graduate School of Agricultural Science - D
- 93 Faculty of Agriculture & Graduate School of Agricultural Science - E
- 94 Faculty of Agriculture & Graduate School of Agricultural Science - F
- 95 Faculty of Agriculture & Graduate School of Agricultural Science - Animal Housing Facility
- 96 Faculty of Letters & Graduate School of Humanities - A
- 97 Faculty of Letters & Graduate School of Humanities - C & Library for Humanities
- 98 Faculty of Letters & Graduate School of Humanities - B
- 99 Chobo-kan (Guest House)
- 100 Takigawa Memorial Hall
- 101 Canteen (LANS BOX)
- 102 Kobe University Centennial Hall (Rokko Hall/ International Student Center/ University Archives/ Seishi & Hatsujo Haiku Library)
- 103 Yamaguchi Seishi Memorial House

