



KOBE UNIVERSITY

GRADUATE SCHOOL OF SYSTEM INFORMATICS

2017

Welcome to the Graduate School of System Informatics

Sustainable development and reinforcement of excellence in science and technology and constant innovations realized by such outstanding excellence are essential factors in coping with many social problems globally increased in the 21st century, including environmental problems, energy problems and aging population problems. Excellence in science and technology is also indispensable in realizing, maintaining and developing a reliable, safe and high-quality life. In order to cope with these social requirements, a transdisciplinary research environment where researchers are able to be inspired by and combine ideas from different research fields, and nurturing and development of highly prominent specialists who are able to participate actively in emerging and interdisciplinary scientific areas are indispensable.

Aiming to cultivate such specialists who can satisfy such needs, the Graduate School of System Informatics was founded in 2010, independent from the Graduate School of Engineering. The school consists of 3 departments: Department of System Science, Department of Information Science, and Department of Computational Science. Through master and Ph.D. programs, students specialize in fundamental theories and methodologies of systems science and engineering, techniques and theoretical base of information science and technology, and science and engineering based on large-scale simulation using the power of supercomputers. In particular, the Intensive Course on Computational Science, which is a consistent course consisting of master and Ph.D. programs, is aimed to foster the first-ever Ph.D. in Computational Science in Japan.

The Graduate School of System Informatics provides an excellent environment of research and education on system informatics, and heartily welcomes promising students who take interests in this emerging field. Enjoy your studies.



Dean of the Graduate School
of System Informatics

TAMAKI Hisashi



ABOUT GRADUATE SCHOOL OF SYSTEM INFORMATICS OF KOBE UNIVERSITY

The Graduate School of System Informatics of Kobe University was established in April of 2010 by reorganizing the Department of Computer Science and Systems Engineering in the Graduate School of Engineering. The Graduate School of System Informatics offers Master and Ph.D. programs in Systems Science, Information Science, and Computational Science. Students can participate in a consistent program through their Master and Ph.D. careers.

Upon completion of the Master's program, students receive a Master's degree in System Informatics or in Engineering. Furthermore, they receive a Doctor of Philosophy in System Informatics, in Engineering, or in Arts and Science upon completion of the program. Moreover, students who pursue and complete Computational Science Intensive Course are awarded a Ph.D. in Computational Science.



ADMISSION POLICY

The Graduate School of System Informatics offers educational research programs through which students are trained not only to develop and expand new disciplines aimed at the creation of new knowledge and value, but also to possess high creativity and an international mindset to make a positive contribution. The core of our new disciplines is System Information (meaningful information that exists within a wide range of systems, through the nature, the engineering, and the society), and their pillars are three academic fields of each department.

The Graduate School therefore actively accepts not only persons who have studied system technology, information technology, and simulation technology in engineering or information system science in their undergraduate and graduate programs, but also those who have a high interest and desire to apply and to expand the scope of these technologies in the various areas of specialization within the science, the medical, the cultural science, and the social science fields.



EDUCATION

In our Graduate School of System Informatics, we have developed a structured education capable of equipping its students with broad, advanced knowledge and skill and, more particularly, a distinctive education program that includes a coherent education system covering a Master Program and Doctoral Program for realizing an education capable of fostering advanced engineers and researchers in the field of computational science.

Master Program

Our Master Program is geared toward creating highly creative, advanced professionals possessing a broad knowledge in each departmental field as well as an interdisciplinary perspective.

The program provides a highly professional education in the student's main department through basic departmental courses and departmental application courses, and enhances the student's multidisciplinary education by establishing common courses within the Graduate School of System Informatics (fundamental courses that are common to all three departments) and introducing inter-graduate-school courses (courses that cross over our five graduate schools of natural science: Graduate School of Science, Graduate School of Engineering, Graduate School of Agriculture, Graduate School of Marine Science, and Graduate School of System Informatics).

By incorporating within this education system and research guidance through a master's thesis, our Master Program makes every effort to cultivate high creativity and problem solving skills.

Doctoral Program

Our Doctoral Program promotes education and research for fostering researchers, higher education research faculty members, and advanced professions having advanced independent research skills, high creativity, and an international mindset for identifying, exploring and resolving problems.

The program establishes rigorous courses related to the student's doctoral thesis, requiring presentations over time in relation to investigational research, problem excavation, research planning, research implementation, research result organization, and methods for solving unresolved issues.

The program also introduces a system of professional courses taught by multiple faculty members as well as cross - graduate - school courses, thereby fostering human resources equipped with advanced expertise and a wide perspective.

Computational Science Intensive Course

In an effort to aid our students in establishing careers as researchers specialized in computational science, we also have established a "Computational Science Intensive Course" which provides the student with a coherent education from the Master Program on through the Doctoral Program.

In principle, our intensive course is an education program that targets persons who have graduated from an undergraduate school of a university and, unlike a general course where the student completes the Master Program and then enters the Doctoral Program, is designed with the objective of the student obtaining a doctoral degree from the start. Based on a curriculum that complements various fields of education through collaborations with universities nationwide and short-term, intensive seminars, the course fosters human resources equipped with practical ability related to high-performance computation as well as highly professional knowledge and skills related to the fields of computational science.

Awarded Degrees

Master Program

- Master of System Informatics
- Master of Engineering

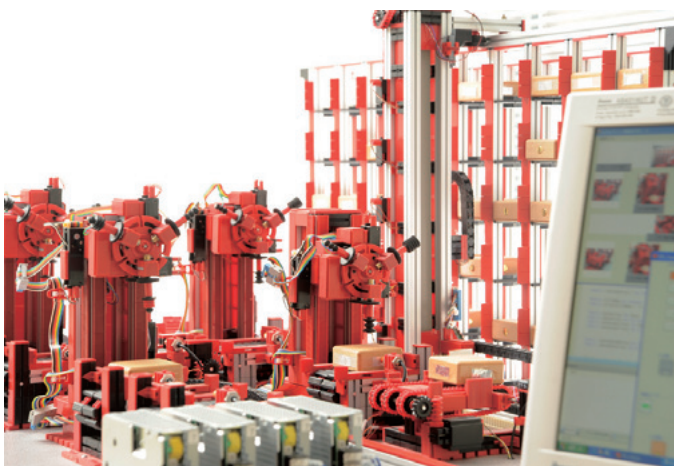
Doctoral Program

- Doctor of Philosophy in System Informatics
- Doctor of Philosophy in Engineering
- Doctor of Philosophy
- Doctor of Philosophy in Computational Science
[only in the Computational Science intensive course]

Department of Systems Science

In the Department of Systems Science, the student pursues basic theories and methodologies for analyzing, designing, constructing, and operating systems of increasing size and complexity. The student works with concepts and functions that are common to a variety of systems, theoretically, scientifically, and in practice, without specializing in a specific engineering field, such as mechanical, electrical, or information engineering. Additionally, the student integrates software engineering and hardware engineering, pursues real world and information world connections, and acquires an academic education and research experience related to a wide variety of theories and engineering, from system infrastructure to integration.

Division	Research Group	Research Topics
Fundamentals of Systems Science	Systems Planning	Operational Research, Production Systems Engineering, Social Systems Engineering, Optimisation, Multi-Agent System, Management Engineering, Decision Support Theory, Service Engineering, System Simulation, Medical Engineering
	Optimum System Design	Optimization, Optimum Structural Design, Optimal Control, Robotics, Adaptive Structure, Nonholonomic System, Human Interface, Image Analysis, Image Recognition, Biomechanics
	Applied Optics	Instrumentation Optics, Information Photonics, Computational Optics, Physical Optics, Image Processing, Optical Tomography, Optical Data Storage, 3D Display System, Optical Supercomputing, Quantum Information Science
	Systems Control	Control Systems Theory, Systems Optimization, Computer Aided Design of Control Systems, Robust Control, Advanced Control, Optimal Control, Vibration Control, Hybrid Systems, Large Scale Systems, Modeling
Innovation of Systems Science	Mathematical System Analysis	Optimal Control Theory, Inverse Problem, Differential Operator Theory, Nonlinear PDE's, Numerical Analysis, Distributed Control System Theory, Infinite Dimensional Dynamical System, Distributed Stabilization Theory, Variational Problem
	System Analysis	Condition Monitoring, Safety Management System, Maintenance Science, Inverse Analysis, Intelligent Robotics, Sensor Fusion, Robot-Human Interaction, Tele-Operation System, Soft Computing
	Intelligent Systems	Intelligent Decision Making, Virtual Reality, Mixed Reality, Medical Engineering, Computer Aided Diagnosis and Treatment
Applied Robot Science (Mitsubishi Electric Corporation)	Applied Robot Science	Manufacturing System, Instrument and Control System, Motion Planning System, Robot Control System, Human Interface System



Department of Information Science

In the Department of Information Science, the student pursues the exploration and expansion of new academic fields of information science and technology that will contribute to an advanced information society. The Department of Information Science thus provides the student with an education and research experience not only specifically in computer programming, but also in the search for new methodologies related to the construction of basic mathematical information theories and information processing as well as advanced information application technology, with a focus on computers, networks, information systems that organically combine computers and networks, content media, and intelligence, resulting in a balanced education and research experience.

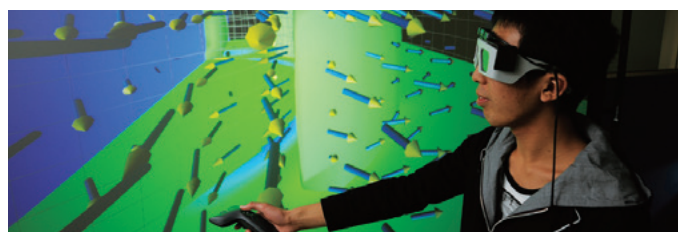
Division	Research Group	Research Topics
Foundation of Information Sciences	Mathematical Logic and Statistics	Mathematical Logic, Mathematical Statistics, Foundations of Mathematics, Foundations of Informatics, Axiomatic Set Theory, Model Theory, Proof Theory, Computability Theory, Combinatorics
	Processor Architecture	Processor Architecture, VLSI systems, VLSI Memory, Low Power Design, Media Processing
	Software Science	Logic Programming, Constraint Programming, Declarative Programming, Programming Language Processing Systems, Theorem Provers, Combinatorial Optimization, SAT
	Telecommunications	Information and Communication Engineering, Protocol Design, Performance Evaluation, Parallel and Distributed Processing, System Software
Intelligent Informatics	Integrated Information Systems	Integrated Circuit Design, Electromagnetic Compatibility, Advanced Packaging, Ubiquitous Hardware Systems, Hardware Security
	Knowledge and Information Processing	Biodata Processing, Agricultural Data Processing, Information Retrieval, Content Analysis, Network Analysis, Data Integration, Data Mining, Statistical Machine Learning, Large-scale Data Analysis
	Media Informatics	Speech/Image/Movie Recognition, Media Integration, Semantic Understanding, Dialogue/Conversation Processing, Intelligent Communication, Universal Communication, Disaster Information Processing, Music Information Processing, Signal Processing, Pattern Recognition
	Emergent Computing	Emergent System, Autonomous Decentralized System, Mathematical Programming Model, Agent Model, Adaptation/Learning Algorithm, Scheduling, Interaction
Kansei and Media Art (ATR)	Kansei and Media Art	Human-Robot Interaction Technology, Voice Interaction Technology, Haptic Interaction Technology, Communication Media, Partner Media, Media Presentation Technique, Multilingual Speech Translation, Situation Recognition Technology, Network Robotics



Department of Computational Science

In the Department of Computational Science, the student pursues the theories and methodologies related to the quest for science and technology based on a computational approach, and the theories and basic technologies of massive computation in support thereof. As a result, the program provides the student with an education and research experience in the technical foundation of ultra-high-speed, massively parallel systems; the basics of a simulation, such as mathematical modeling, simulating, and visualizing, and the application thereof; the understanding and clarification of natural events based on a computational approach; and the prediction of unknown phenomena and events, taking into consideration computational science industrial applications and societal contributions.

Division	Research Group	Research Topics
Fundamentals of Computational Science	Basics of Computational Science	Numerical Analysis Finite Difference Method, Finite Element Method, Parallel Algorithms, Large Scale Simulation, Program Tuning Tools, Discrete Mechanics, Differential Geometry, Global Analysis, Mathematical Engineering
	Computational Intelligence	Artificial Intelligence, Machine Learning, Multimedia Processing, Data Mining, Text Mining, Information Retrieval, Software Engineering, Service/Cloud Computing, Ubiquitous Computing
	Computational Fluid Dynamics	Computational Fluid Dynamics, Finite Volume Method, Finite Element Method, Massively Parallel Simulation, Coupled and Unified Simulation, Complex and Complicated Turbulence, Combustion flow, Grid Generation, Moving Boundary Method, Applied Aerodynamics, Industrial Applications, Vehicle Aerodynamics, Automotive Engine
	Simulation Techniques	Simulation Methods in General, Computational MHD and Its Visualizations, Yin-Yang Grid and Its Applications, Scientific Visualization, Solar Dynamo, Geodynamo
Innovation of Computational Science	Computational Molecular Engineering	Massively Parallel Computation Algorithms, Explicitly Correlated Electronic Structure Theory for Highly Accurate Calculations, Strongly Correlated Electronic State Theory, Scalable Molecular Orbital (MO) Theory for Large Molecules, Model Space Quantum Monte Carlo Method, QM/MM Methods, Alternative Energy
	Computational Biology	Biomolecular System, Ab Initio Simulation, Multiscale Simulation, Large-Scale Parallel Computation, Medical and Pharmaceutical Applications, Molecular Dynamics Method, Molecular Orbital Method, Monte Carlo Method
	Computational Robotics	Environment Adaptive Robotics, Cognitive Motion, Human Interface, Biomimetic System, Care Support Engineering, Computational Robotics, Computational Linguistics
	Computational Space Science and Engineering	Space Environment Simulation, Spacecraft-Plasma Interaction, Application of Particle Simulation, Massively Parallel Particle Simulation, Satellite System Simulation
Applied Computational Science (JAMSTEC)	Applied Computational Science	Earth Simulator, Multiscale Simulation, Atmosphere-Ocean Coupled General Circulation Model, Typhoon Simulation, Nonhydrostatic/Hydrostatic Ocean Model, Earth Sciences, Lithosphere Dynamics, Earthquakes, Plate Motion, Discrete Element Method
Large Scale Computational Science (RIKEN AICS)	Large Scale Computational Science	Simulation of Complex Climate System, Numerical Software Library, Quantum Material Science, Lattice QCD, Biosimulation, Cellular Simulation



PRINCIPLES AND AIMS OF GRADUATE SCHOOL OF SYSTEM INFORMATICS

System informatics is an academic field that strives to contribute to the development, processing, and utilization of “system information,” which is meaningful information that exists within a large-scale, complex system, based on highspeed, large-capacity computing technology. The term “system” used here does not refer to a so-called information system, but rather to a broad “system” covering a variety of areas, from nature and engineering to society, including space, earth, people, living organisms, artificial materials, and the like.

The Graduate School of System Informatics targets such a “system” as well as the “system information” that exists within that system, defining the three academic fields below as the pillars of its education and research. With each of these three fields at its core and through the integration thereof, the Graduate School strongly promotes education and research related to the theories and methodologies of the pursuit of system informatics.

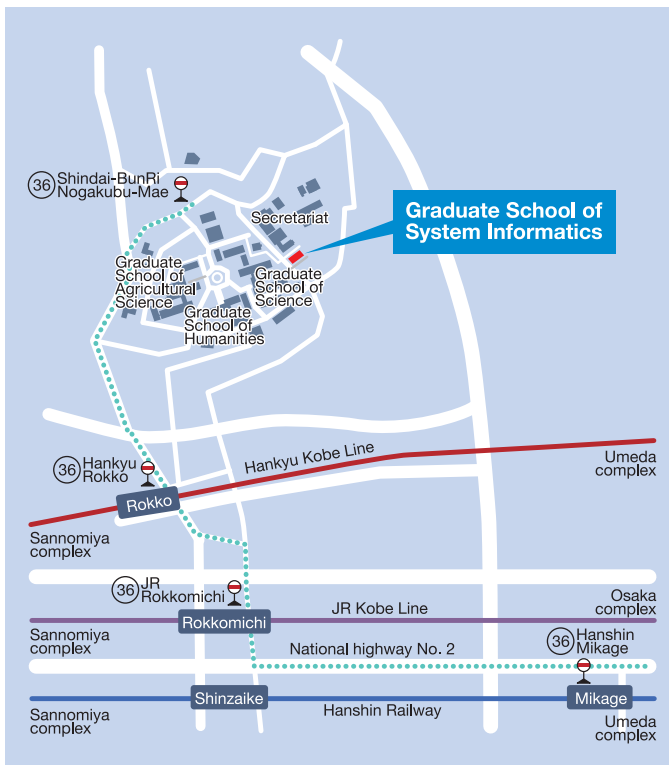
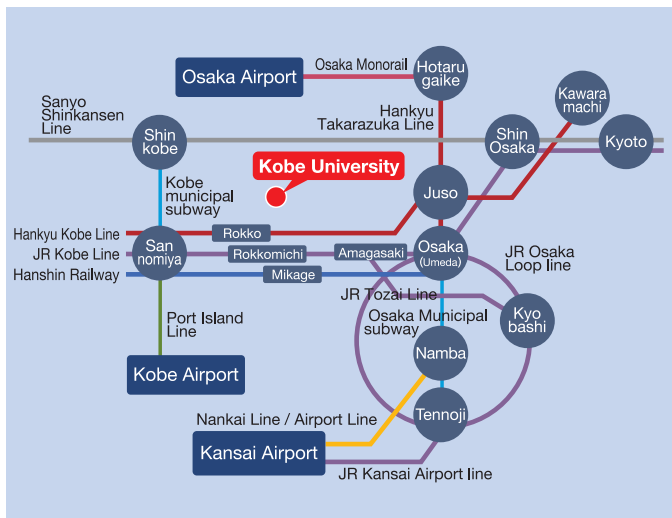
COLLABORATIVE DIVISIONS AND COOPERATIVE PROGRAM

The Graduate School of System Informatics prepares collaborative divisions with several research institutes in fields related with system informatics. While the Ph.D. program has already collaborated with “Mitsubishi Electric Corporation” and “Advanced Telecommunications Research Institute International (ATR)”, the Master program also offers such collaborative divisions throughout the fields of system informatics. We offer collaborated programs with “Japan Agency for Marine-Earth Science and Technology (JAMSTEC)” that has the outstanding research results using Earth simulator, and with “RIKEN” that owns the K computer. Furthermore, we strive to organize the Educational Research Propulsive System fully supported by researchers and faculty of each institute.

The Graduate School of System Informatics cooperates with other universities which have outstanding strength in fields related with system informatics. Concretely, we cooperate with Kyoto University, Osaka University, Nara Institute of Science and Technology, University of Tsukuba, and Nagoya University. The cooperative program offers an opportunity where educational resources of each school are used. Especially, we build and flexibly expand collaborative educational system which corresponds to the development of each academic field, and offers graduate students all over Japan our educational programs using the K computer.



Access Map



Bus Line

From the Hankyu Railway Kobe Line Hankyu Rokko Station (time required: 15-20 minutes)

By Bus

From the Hankyu Railway Kobe Line Rokko Station, JR Nishi-Nihon Kobe Line (Tokaido Main Line) Rokkomichi Station, Hanshin Railway Kobe Line Mikage Station

- Take Kobe Municipal Bus Line 16 bound for "Rokko Keburushita" and get off at the "Kokusai Bunka Gakubu Mae" bus stop.
- Take Kobe Municipal Bus Line 36 bound for "Tsurukabuto Danchi" and get off at the "Shindai Honbu Kougakubu Mae" bus stop.
- Take Kobe Municipal Bus Line 36 bound for "Tsurukabuto Danchi" and get off at the "Shindai Bunri Nougakubu Mae" bus stop.

By Taxi

- From the Hankyu Railway Kobe Line Rokko Station: About 5 to 10 minutes
- From the JR Nishi-Nihon Kobe Line (Tokaido Main Line) Rokkomichi Station: About 10 to 15 minutes
- From the Hanshin Railway Kobe Line Mikage Station: About 15 to 20 minutes
- From the JR Nishi-Nihon (Shinkansen) Shin-Kobe Station: About 15 to 20 minutes



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