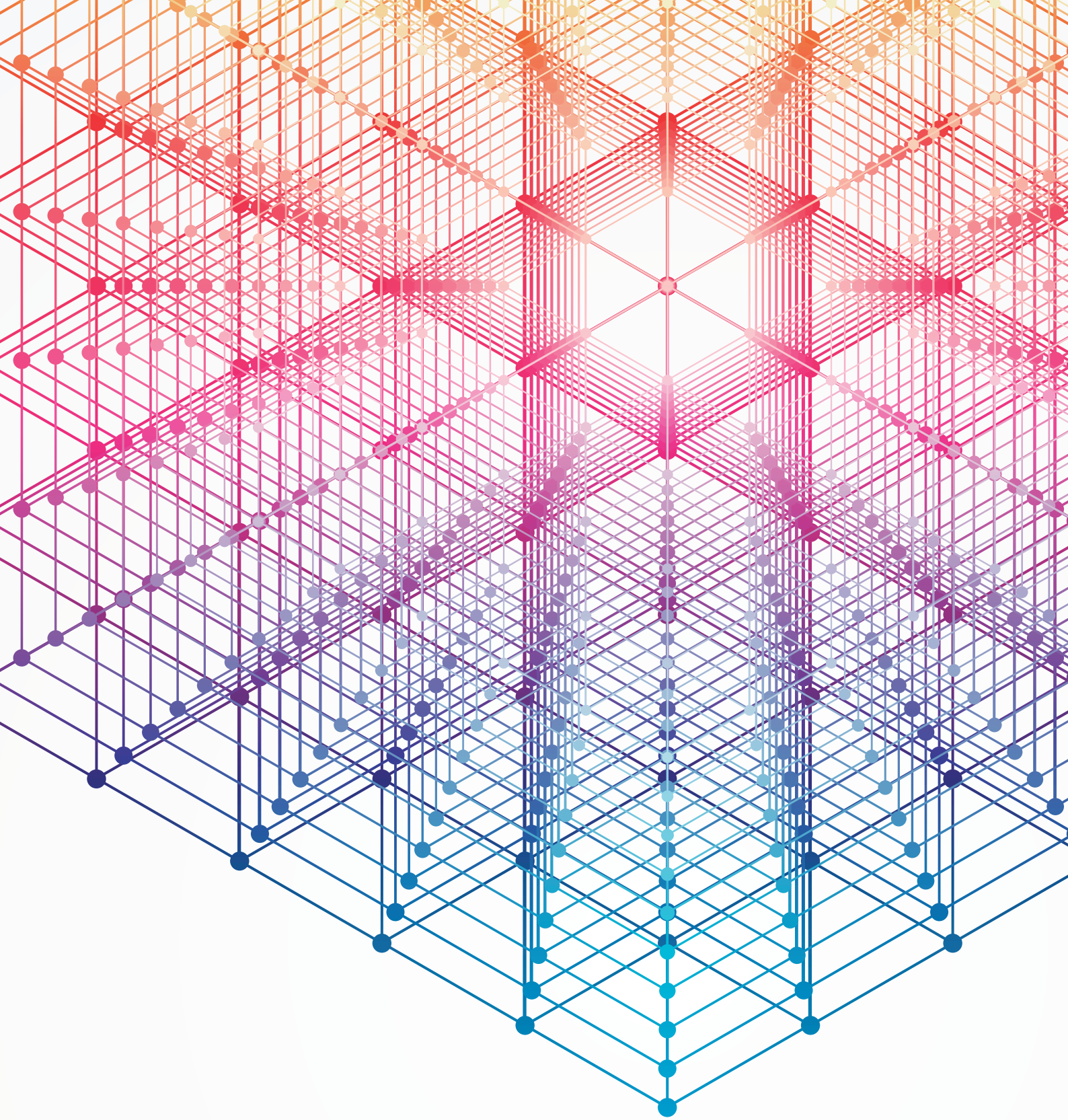


GRADUATE SCHOOL OF SYSTEM INFORMATICS

KOBE UNIVERSITY 2020

Message

Message from the dean

Welcome to the Graduate School of System Informatics

Dean of the Graduate School of System Informatics

OHKAWA Takenao

The Graduate School of System Informatics was founded in April 2010 as the first graduate school on information-related fields at Kobe University. Our graduate school consists of three departments: Department of System Science, Department of Information Science, and Department of Computational Science. We are responsible for promoting education and research on methodologies for analyzing, designing, and operating large-scale complex systems, on theories and techniques for advanced information processing, and on the fundamentals and applications of large-scale simulations in a high-performance computing environment.

The Graduate School of System Informatics has just marked its 10th anniversary this year. Although it has been only ten years, the situation surrounding our graduate school has changed dramatically during this period. Research topics closely related to our graduate school, such as artificial intelligence, data science, the Internet of Things, big data, robots, etc., have been gaining a lot of attention, as well as the upcoming Society 5.0, a rich human-centered society of the future. The supercomputer “K”, whose installation in Kobe city had been one of the triggers for starting our graduate school, has already retired and the development of “Fugaku” with further improvement of its performance is on its way.

Development of human resources who can contribute to the creation of new values by deepening and integrating these cutting-edge technologies is our important mission as an organization that plays a central role in education and research toward the realization of Society 5.0. I sincerely hope that many students will gather at the Graduate School of System Informatics and enjoy studying how to create an attractive future society.

ABOUT THE GRADUATE SCHOOL OF SYSTEM INFORMATICS AT 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. Moreover, students who pursue and complete the 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 knowledge and value, but also to possess high creativity and an international mindset to make a positive contribution towards global society. The core of our new disciplines is System Information (meaningful information that exists within a wide range of systems, through nature, engineering, and society), and their pillars are the 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 science, medical, cultural science, and social science fields.

EDUCATION

At the Graduate School of System Informatics, we have developed a structured education capable of equipping its students with broad, advanced knowledge and skills. We offer a distinctive education program that includes a comprehensive education system covering a Master Program and Doctoral Program for realizing an education capable of fostering advanced engineers and researches in the field of computational science.

Master Program

Our Master Program is geared toward creating highly creative, advanced professionals possessing broad knowledge of 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.

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]

Doctoral Program

Our Doctoral Program promotes education and research for fostering researchers, higher education research facility faculty members, and professionals possessing 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

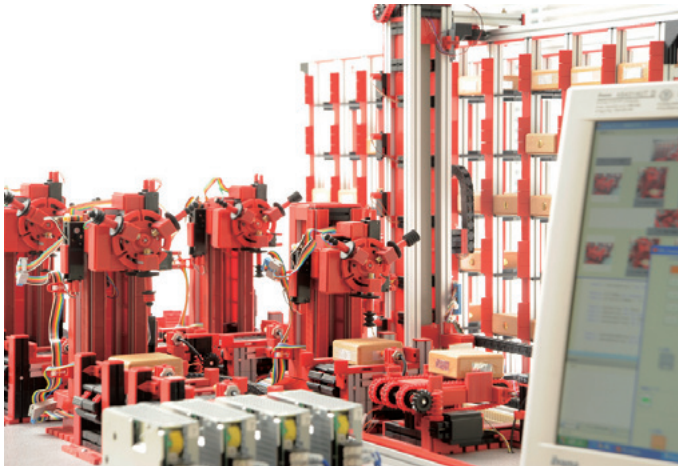
In an effort to aid our students in establishing careers as researchers specialized in computational science, we also have established a Computational Science Intensive Course" which provides the student with a coherent education from the Master Program on through the Doctoral Program.

In principle, our intensive course is an education program that appeals to those who have graduated from the 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 short-term, intensive seminars, the course fosters human resources equipped with practical skills related to high-performance computation as well as highly professional knowledge and abilities related to the fields of computational science.

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, while 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 both academic education and research experience related to a wide variety of theories and engineering, from system infrastructure to integration.

Division	Education/Research Fields	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
	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	Environment Adaptive Robotics, Cognitive Motion, Human Interface, Bio-mimetic System, Care Support Engineering, Computational Robotics, Computational Linguistics
Innovation of Systems Science	Mathematical System Analysis	Distributed Parameter Control Systems Theory, Infinite Dimensional Dynamical Systems,Operator Theory,Nonlinear PDEs, Mathematical and Theoretical Biology, Robust Control Theory, Nonlinear Systems Theory, Large Scale and Hybrid Systems Theory, Control System Design via Numerical Optimization, Time Delay Systems
	System Analysis	Intelligent Robotics, Sensor Fusion, Robot-Human Interaction, Tele-Operation System, Soft Computing, Measurement engineering, Biological information measurement, Nondestructive testing
	Intelligent Systems	Intelligent Decision Making, Virtual Reality, Mixed Reality, Medical Engineering, Computer Aided Diagnosis and Treatment, Educational/ Learning Support System, Learning Analytics, Educational Big Data
Applied Robot Science (Collaborative Program)	Applied Robot Science	Manufacturing System, Instrument and Control System, Motion Planning System, Robot Control System, Human Interface System



Department of Information Science

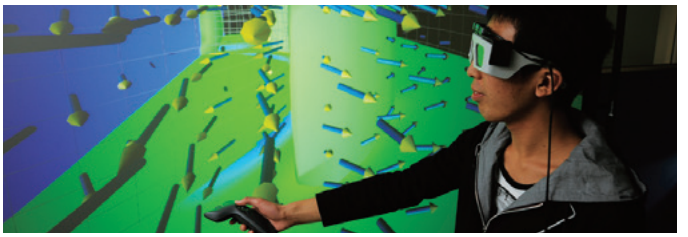
In the Department of Information Science, the student pursues the exploration and expansion of new academic fields of information science and technology that will contribute to an advanced information society. The Department of Information Science thus provides the student with an education and research 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	Education/Research Fields	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, Algebraic Combinatorics, Discrete and Computational Geometry
	Processor Architecture	Processor architecture, VLSI systems, VLSI memory, Low powerVLSI design, Electronic Devices, Sensing Systems. Multimedia Systems, Human Interface Systems
	Software Science	Logic Programming, Constraint Programming, Declarative Programming, Programming Language Processing Systems, Theorem Provers, Combinatorial Optimization, SAT
	Telecommunications	Information and Communication Engineering, Protocol Design, Perfomance valuation,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, Pattern Recognition
	Emergent Computing	Emergent System, Autonomous Decentralized System, Mathematical Programing Model, Agent Model, Adaptation/Learning Algorithm, Scheduling, Interaction, Nonholonomic System, Mobile Robot, Drone, Manipulator Dynamics
Kansei and Media Art (Collaborative Program)	Kansei and Media Art	Human-Robot Interaction Technology, Voice Interaction Technology, Haptic Interaction Technology, Communication Media, Partner Media, Media Presentation Techniue, Multilingual Speech Translatio, Situation Recognition Technology, Network Robottics
Integrated Intelligence (Collaborative Program)	Integrated Intelligence	machine learning, artificial intelligence, statistical modeling, pattern recognition, Bayesian statistics, intelligent information processing, bigdata analysis, optimization

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	Education/Research Fields	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, Finte Volume Method, Finte 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	Yin-Yang Grid and Its Applications, Large Scale Simulations, Computational MHD and its Visualizatons, Geodynamo, Big Data Visualization, Multivariate Data Visualization, Visual Data Analytics
Innovation of Computational Science	**Computational Molecular Engineering**	Massively Parallel Computing Algorithms, Explicitly Correlated Electronic Structure Theory, Strongly Correlated Electronic States, Scalable Molecular Orbital Theory, Model Space Quantum Monte Carlo, QM/MM Methods, New 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 Space Science and Engineering	Numerical Simulations on the Lunar and Planetary Environments, Satellite-Plasma Interaction, Numerical Simulations on Ion Beam Appplication, Development of Plasma Particle Simulation Method
Applied Computational Science (Collaborative Program)	**Applied Computational Science**	Earth Simulator, High-Performance Computing, Multiscale Simulation, Earth Sciences, Lithosphere Dynamics, Earthquakes, Plate Motion, Particle Simulation Method, Scientific Visualization, Evolution of the Earth's Deep Interior, Large Scale Linear and Nonlinear Iterative Solver
Large Scale Computational Science (Collaborative Program)	**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

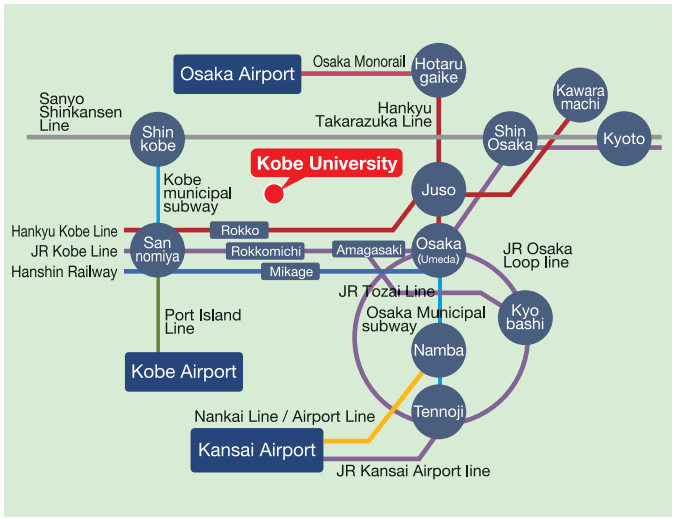
System Informatics is an academic field that strives to contribute to the development, processing, and utilization of “system information,” which is meaningful information that exists within a large-scale, complex system, based on highspeed, large-capacity computing technology. The term “system” used 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.

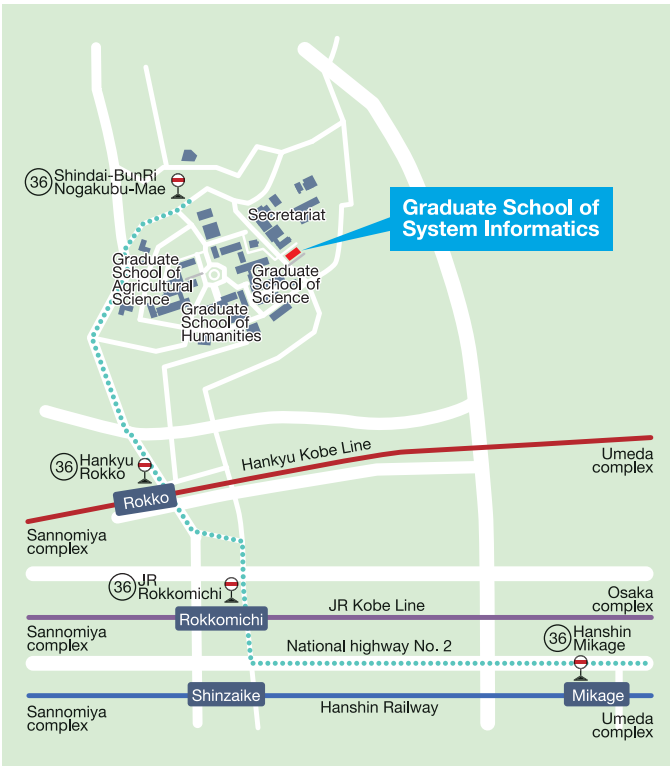
The Graduate School of System Informatics targets such a “system” as well as the “system information” that exists within that system, defining the three academic fields below as the pillars of its education and research. With each of these three fields at its core and through the integration thereof,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

COLLABORATIVE DIVISIONS

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

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