Graduate School of System Design and Management, Keio University
Learn System Design and Management in English While Being in Japan
—A Gateway to New Perspectives and Distinct Careers

Broaden Your Horizons with World-Class, Cutting-Edge Knowledge

The Graduate School of System Design and Management at Keio University (Keio SDM) pursues problem solving with a "systems" approach by capitalizing on a broad range of perspectives from the natural sciences as well as from the humanities and social sciences. Mid way between downtown Tokyo and Yokohama close to both by train, Keio SDM enables students to learn the world's leading systems engineering and design thinking in both Japanese and English. Keio SDM has a diverse student population made up of various backgrounds, age-groups, and nationalities. Not all students have a background in natural sciences and engineering; and many are professionals who are working in Japanese enterprises and government organizations. At Keio SDM students have ample opportunities to broaden their views by studying alongside these individuals as they encounter diverse values and ways of thinking.

About Keio University

Keio University is among the most prestigious private universities in Japan. It was founded in 1858 by Yukichi Fukuzawa, a leader of modern Japan who is also known as the man portrayed on Japan’s 10,000-yen note. Many Keio alumni are successfully leading in a wide range of fields, including business, technologies, politics, and education. Being a Keio graduate is perceived as prestigious in Japan.
Learn Systems Engineering and Design Thinking

Keio SDM deals with a multiplicity of large and complex systems. As we seek solutions, we make sure to consider social needs, such as environmental symbiosis, safety and security, cutting-edge technologies, international cooperation, and crisis management.

Two pillars of problem solving methods are employed at Keio SDM. One is systems engineering, which was developed initially for the purpose of designing large systems, including aerospace and military systems. Now it has been extended to include the social sphere. Keio SDM is the only Japanese university participating in the Council of Engineering Systems Universities (CESUN). Students can learn all about systems engineering from the basics to the cutting-edge at Keio SDM.
The second pillar is known as design thinking. It is a development method which uses techniques, such as fieldwork, brainstorming, and workshops, to generate ideas. Its aim is innovation through drawing out the creativity of participants. With systems engineering alone, it is difficult to accommodate different perspectives of multiple stakeholders for the purpose of innovation. Design thinking, on the other hand, tends to be weak at taking a systematic approach to the shaping of ideas. Keio SDM has successfully created a development method which combines the two in a complementary way. At Keio SDM students learn how to create an optimal fusion of systems engineering and design thinking. This equips them with the capability of tackling large and complex systems.

Developing a Wealth of Skills

Keio SDM nurtures future systems designers and project managers who are capable of designing and managing multiple systems. One needs to have a diverse set of skills in order to coordinate with multiple stakeholders for the purpose of creating systems. Keio SDM offers a range of programs to produce individuals with a wide spectrum of skills and abilities.
Our curriculum aims to build collective strengths by combining knowledge with experience. Students first gain knowledge from lectures on systems engineering, design thinking, management capability, and specialized subjects. They are then invited to work on real-life projects and explore practical solutions. With our approach of combining knowledge with experience, students grow into integrated professionals who are capable of building and managing systems with precision.
Students in the master course learn the basics of systems engineering through the mandatory core subjects. Additionally they take specialized subjects covering specific fields and recommended advanced subjects covering multidisciplinary topics according to their interests. By creatively combining these subjects, students can broaden their knowledge towards a wide spectrum of subjects.

Classes are offered in Japanese and/or English. It is possible to complete the master course by selecting only classes in English. Core subjects are offered both in Japanese and English; Japanese classes normally begin in April while English classes begin in September.

It takes practical experience to effectively design and manage real-world systems. Students in the first year master course learn design thinking and work on real-life issues in the Design Project. They then proceed to practical research in special research subjects; and the results are compiled in their theses. At Keio SDM we set high standards for masters research.

The doctoral program offers more specialized research opportunities. Doctoral students can take masters classes according to their interests. Quite a few of those theses end up presenting at international conferences.
Students in the master course first learn the basics of systems engineering and other fundamental skills necessary to deal with systems. Building on this, they acquire knowledge about systems of various fields in specialized subjects. Additionally, they learn design thinking in the Design Project.

**Linking Knowledge**

Students first learn the V-model, an important concept of systems engineering. The V-model structures systems by decomposing requirements and integrating parts and their validation. This model can be used as a broad framework to capture how the entire process relates to each specific part. One can apply the model to system development of various fields, including those which are scientific and technical, social, and human.

Building on basic knowledge of the V-model, students take a variety of specialized subjects. Students can learn in a systematic and structured manner by using the model as a common framework, linking a broad spectrum of knowledge.

At Keio SDM, we use the V-model to decompose, integrate, design, and evaluate by precisely defining the diverse requirements of the stakeholders, by sharing information, and by creating complete pictures of systems.
Intensive Lectures in English

Keio SDM’s strength is not only that the curriculum can be completed solely in English. A series of intensive lectures are offered in English by the world’s leading professionals and researchers from different fields. This international learning environment as such makes Keio SDM an ideal environment for the growth of globally-minded professionals who are capable of accommodating different cultural perspectives.

List of Past Intensive Lectures (with titles as they were at the time)

- “System Architecture and Integration”
  Prof. Rashmi Jain (National University of Singapore)
- “Supply Chain Management and Business Games”
  Prof. Paul Schoensleben (ETH, Switzerland)
- “Collective Dynamics of Firms”
  Prof. Dr. Frank Schweitzer (ETH, Switzerland)
- “Technical Entrepreneurship & Management”
  Prof. Duncan Moore (University of Rochester, US)
- “Risk Management”
  Prof. Gilles Motet (INSA, France)
- “Space Applications”
  Prof. Dipl.-Ing. Heinz Stoewer (President Space Associates GmbH, Germany)
- “Stanford Center for Design Research Workshops”
  Dr. Larry Leifer (Stanford University, US)
- “Object-Process Methodology (OPM) with Application to Systems Engineering”
  Prof. Dov Dori (MIT, US)

From Basics to Application — the Design Project

The Design Project aims to propose innovative systems by using the system design and management method developed collectively by Keio University, MIT, Stanford University, Delft University of Technology, and the University of Adelaide. In the Design Project students put systems engineering into practice while learning about design thinking.

In the Design Project students begin with the basics and then move on to practical learning. After taking a number of lectures taught by guest lecturers from partner universities overseas, students work in groups to work on themes proposed by various organizations. The proposers often include leading Japanese companies; and international students have a great opportunity to get acquainted with the unique characteristics, strengths, and cultures of Japanese enterprises.

Examples of Solutions Derived by Students with the Theme “Safety and Security”

  Proposer company: Adidas
- “Portable Multi Energy Backpack System for Refrigerating Vaccines”
  Proposer company: Kokusai Kogyo group Infrastructure Innovation Institute, Inc.
  Proposer company: Delft University of Technology
- “Safety Premium Point System”
  Proposer company: Suzuki Motor Corporation
- “Design of Bicycle Simulator to Reduce the Risks of Traffic Accidents”
  Proposer company: Toshiba System Technology
Keio SDM emphasize the importance of hands-on experience. Students are encouraged not only to gain textbook knowledge about systems but also to experience real-life situations, to clearly articulate issues, and to come up with innovative, feasible solutions. It is when one is actually seeking solutions to complex systems that most discoveries and realizations come. We believe in experiential learning, that one learns most by doing.

Learning by Doing
—Experiential Learning

Insight into the “On-Site” Realities of Japan

Keio SDM has strong ties with private companies. This means our students have the privilege to observe “on-site” scenes of Japanese companies through various opportunities. For example, we arrange visits to distinctive factories as a part of the curriculum. In the Design Project students have the opportunity to visit the workplaces of proposing companies and work collaboratively with their staff members. Furthermore, Keio SDM has a great number of on-going joint research projects with private companies, facilitating students to have close and frequent communication with the companies. Many faculty members of Keio SDM come from private firms; and some internship opportunities can be facilitated for our students by virtue of their strong connections with the companies. Keio SDM offers its students valuable opportunities to engage with Japanese companies, providing opportunities to gain insight into the secret of their strength and the “on-site” realities.
Laboratory Participation and Thesis Writing  
The Special Research Subject

The master course centers around the Special Research Subject. Students select a specific system and take part in a relevant laboratory. Their research results are compiled into their masters theses. As in the case of the doctoral course, students establish their own themes and conduct extensive research. Research experience helps students deepen their knowledge, equipping them with skills that can be used immediately upon graduation in their work of research and/or development.

Examples of Technical System Research
- Smart Grid
- Mobility System
- Virtual Reality
- Remote Real-time Communication
- Optical Communication
- Robotics
- Space System

Examples of Social System Research
- Policy
- Business Model
- Agricultural System
- Regional Revitalization/Tourism
- Universal Design
- Environment/Resource
- Security/Peace

Examples of Human Systems
- Motivation
- Happiness/Desire/Empathy
- Human-machine Interface
- Culture/Art
- Entertainment
- Organizational Theory
- Cognitive Science

Study Case

Portfolio Optimization for Environmentally-Conscious Automobiles

Many environmentally-conscious automobiles are being developed and sold, such as the ones based on electric, fuel cell, natural gas, and gasoline-electric hybrid technologies. We use the system approach (simulation and system optimization) to study portfolio maximization—analyzing which type of automobile should be brought to the mainstream given the various constraints, such as those related to environment, energy, resources, aging population, and development in emerging nations.

Resilient Community Design: Knowledge Creation for Safety and Security

Communication Design Process: Knowledge Creation for Safety and Security

At Keio SDM we use smart systems, such as IT systems and space systems, in order to create socio-technical services and their processes. In search for resilient community design process, we do research on a disaster-prevention message delivery service using a satellite and GPS receivers. We study a distributed autonomous cooperative community design process that is resilient and based on the fusion of two platforms: dialogue and IT.

Organizational Management  
Establishing Culture and Safety Consciousness within Companies

We conduct research into ways in which companies can develop a positive culture and work atmosphere in which staff members feel motivated and rewarded. Our research also asks questions concerning how to establish excellent companies with a high level of safety consciousness, risk management, and profitability. We study companies’ strategies that enable effective management—creative ways to motivate employees while nurturing teamwork and good communication within an organization.

Disaster-Prevention Message Delivery Service
Keio SDM celebrated its 13th anniversary in April 2020. When we first opened, our research was headed in a direction that was so cutting edge that it had yet to be mentioned in the media. The first faculty members at SDM gathered from across different fields, and there was a real sense of comradery among them, each person trying in their own way to understand what a “system” actually was—often by trial and error. But just five or six years later, the world was beginning to discuss the need to think about things as holistic systems, with more and more newspaper articles dealing with issues beyond what SDM was doing at the time. While we now have a deeper understanding of systems engineering, this has resulted in less interdisciplinary dialogue between faculty members. Now, more than a decade since the founding of SDM, it is a good time to get back to basics—to taking on challenges that get us to roll up our sleeves and work together like we did back then. Now is not the time to maintain the status quo. It’s time to look back on the things we have done so that we may find a way forward.

**Technology, Well-being & the Baseline**

In 2007, as we were gearing up to launch Keio SDM the following spring, the plan was to approach systems engineering from the so-called hard sciences. It was at this time that we were approached by the board of trustees, who convinced us to include fields from the humanities and social sciences as well. This was quite a challenge for us at the time, but SDM has since gone on to embrace diversity, in the purest sense of the word, by doing truly transdisciplinary research. That approach has led to new and unexpected fields of research, including topics like “happiness research,” though I personally prefer the English expression “well-being.” In my current research, I am exploring the safety of autonomous vehicles, and in this case, eliminating unsafe conditions to create a baseline for vehicle safety. We take the same approach with “well-being.” If we can judge a situation to be “not unwell,” then we can create a baseline for “well-being.” And beyond that baseline there is no limit for vehicle safety and well-being alike. But first, it is important to establish this concept of a baseline.

In the coming years, the integration of AI will alter our world more than ever before. It has been pointed out that even if an autonomous vehicle AI is trained to recognize people in order to avoid collisions, an AI trained using only images of white people will struggle to identify black people. People who are in the design and development process...
must think critically and ethically about a technology and its implications. Further, if an automated driving system is supposed to exist for the well-being of people and of society as a whole, then we must also define what well-being is for that automated driving system. Even as our society grows more convenient with each technological development and good intention, the threat of global warming looms ever closer. There are plans to escape to Mars if we can no longer live on Earth, but is it really acceptable to abandon our planet? Keio SDM must be a place where we think logically about these issues from the standpoint of systems thinking.

**Setting Aside Specialization**

I often talk to my students about setting aside their specialties. Once you set aside your expertise, you can start thinking in terms of systems. For example, I have been a control engineering researcher for many years, but systems engineering begs the question, “Is control even necessary?” That is not to say that expertise is not important. When I say “set aside,” I do not mean to write it off as inconsequential. However, in taking a systems engineering approach, you have to go beyond looking at things within your own field of expertise to capture the scope of the entire system from multiple aspects.

In fact, the reason I first became interested in Systems Modeling Language (SysML) was because of my expertise in control engineering, a topic that was covered in the book *A Practical Guide to SysML*. And of course, there are many things that involve “control” when creating a system. However, if you read more closely, you’ll notice there is little about control in the book. I was very lucky to learn about the world of systems engineering and broaden my horizons beyond the concept of control, even having the opportunity to translate the book. In 2019, I was also able to learn a lot as I translated and published *The Systems Engineering Handbook, 4th Ed.*, which describes the essence and necessity of systems engineering. I think these experiences at SDM really embody the Keio maxim of hangaku-hankyo, or “learning while teaching, teaching while learning,” as academic faculty continue to learn alongside their students. Years of experience have really shown this to be true.

**Toward a New Decade**

I’m responsible for the mandatory systems engineering courses at SDM, but it is not the kind of content that can be easily understood in a single semester. The best way to know whether you truly understand or comprehend something is to actually do it. I often ask students if they can explain what it really means to “understand” something. Faculty members like me also cannot say we understand something without practicing what is written in the SE handbook. Real learning is a desire to understand more. I want to make SDM a place that encourages dialogue more than ever, a place for faculty and students to work together to deepen their understanding.

A graduate student from China once confided to me over conveyor-belt sushi that he thought Japanese people were not aggressive enough. I want to accept more aggressive students who will do whatever it takes to comprehend something, those who are serious about learning. I think the student and faculty body is already quite diverse at Keio SDM, but I would like to invite even more international students to come and make it a truly global place.

SDM has already been applauded for its work by the public and private sectors, by the Japanese government and corporate world. But there is still so much that we can, and should, do. I want to further strengthen our ability to contribute to society as a whole. But we must interact, share information, and explore new directions with others, rather than continue working alone. Systems engineering, design thinking, and project management—these must be front and center in our research and education and practiced diligently to push the discipline of SDM forward.
Diverse Careers and Fields of Research Create New Challenges

Supervising Professors

Hidekazu Nishimura
Dean, Professor

Shinichiro Haruyama
Professor
Worked: AT&T Bell Laboratories, Sony Computer Science Laboratories, Inc., the Faculty of Science and Technology of Keio University
Research and education interests: Free-space optical communication, information technology for building architecture, augmented reality, computer vision, etc.

Makoto Ioki
Associate Professor
Worked: Mitsubishi Electric Corporation, Japan Space Systems
Research and education interests: Systems engineering, Satellite system and Fault tolerant space system design. Space related business enhancement and International cooperation in space industry

Naohiko Kohtake
Professor
Worked: Japan Aerospace Exploration Agency (JAXA), European Space Agency (ESA)
Research and education interests: Systems engineering for socio-technical system (space system, sports system, urban system), System verification and validation, Computer science

Takashi Maeno
Professor
Worked: Canon Inc., the University of California, Berkeley, Harvard University, and the Faculty of Science and Technology of Keio University
Research and education interests: Human-machine system design, social system design, systems thinking, and systems philosophy

Masaru Nakano
Professor
Worked: Toyota Central R&D Labs., Inc.
Research and education interests: Business engineering, sustainable manufacturing, smart city, urban air mobility, and global and green supply chain

Tetsuro Ogi
Professor
Worked: Mitsubishi Research Institute, Inc., Tokyo University, Tsukuba University
Research and education interests: Human interface, virtual reality, visual data mining tele-immersive communication, and visual simulation

Seiko Shirasaka
Professor
Worked: Mitsubishi Electric Corporation
Research and education interests: Space systems engineering, system development methodology, and system safety

Kenichi Takano
Professor
Former Senior Scientist at Central Research Institute of Electric Power Industry (CRIEPI)
Research and education interests: Risk management and human factors in large scale technology systems

Tomohiko Taniguchi
Professor
Former Councilor, Cabinet Secretary, Deputy Press Secretary, Ministry of Foreign Affairs
Research and education interests: International political economy (currency regime, international financial system), Japan’s diplomacy, and public diplomacy

Naoko Taniguchi
Professor
Research and education interests: Political Science, Political Behavior, Political Methodology, Political and social system making society better

Tetsuya TOMA
Professor
Former Advanced Product Development Specialist at 3M Company
Research and education interests: Program/project management and communication design for communities such as medical/health care, education or local resource utilization
The backgrounds of Keio SDM’s faculty vary from industrial experience to active careers in the international arena. Their career paths and research areas are so diverse that new research ideas and activities are being generated every day at Keio SDM through borderless intellectual interactions.

New Challenges

Advisors and Visiting Professors

Yoshiaki Ohkami
Executive Advisor of SDM Research Institute
Areas of expertise: Design and management of large scale space systems, strategic systems engineering

Taketoshi Hibiya
Executive Advisor of SDM Research Institute
Areas of expertise: Large scale systems engineering (basic science)

Vittal Anantatmula
Guest Professor, Keio University
Professor and Director of project management programs, Western Carolina University
Research Interests: project management teams, risk management, knowledge management effectiveness, project management maturity, and leadership.

Laurent Balmelli
Guest Professor, Keio University
He is a former manager at IBM in charge of architecting the new generation of offerings and tools for Systems Engineering and Product Development. Since 2003, he has represented IBM within the SysML standard team and is one of the lead authors of the SysML language specification.

Ockie Bosch
Professor, Systems Design & Complexity Management, the University of Adelaide
He specializes in the area of systems dedicated to sustainable development and elaborates information systems, mechanisms for knowledge dissemination, collaborative learning and processes for linking science with management and policy making.

Peter Buist
Guest Associate Professor, Keio University
Manager of the Galileo Reference Center European GNSS Agency (GSA)
Areas of expertise: Global Navigation Satellite System (GNSS), Space Systems Engineering

Olivier L. de Weck
Guest Professor, Keio University
Professor, Aeronautics and Astronautics and Engineering Systems, MIT
He is a leader in systems engineering research. He focuses on how complex man-made systems such as aircraft, spacecraft, automobiles, printers and critical infrastructures are designed and how they evolve over time.

Rashmi Jain
Guest Professor, Keio University
Professor, Monclair State University
Her areas of expertise are systems engineering and integration, service operations management, and systems architecture and design. She has extensive experience of teaching graduate students and senior executives both in the U.S. and overseas businesses and institutions.
I chose Keio SDM because I wanted to deepen my knowledge of systems engineering; at the same time I was interested in learning designs and creativity in addition to management. I think that creativity requires us to look at things from multiple dimensions and to integrate the pieces. South Africa and Japan have completely different cultures and ways of thinking. For example, work and personal life are not mixed up in South Africa; whereas in Japan the lines between work and private life blur. Focusing on such differences, we may be able to generate innovative ideas for human development and marketing activities.

Students are all open-minded and willing to help one another at Keio SDM. At first I felt nervous because of my limited Japanese language skills. In the "Big Room" where students gather, however, I feel free to talk to my peers just about anything without hesitation. This helps me relax and enjoy the studying abroad experience at Keio SDM.
I am a researcher of ground-based satellite control operations at Vietnam National Satellite Center, currently on the Center’s study abroad program to Japan funded by a Japan-Vietnam intergovernmental project. I chose Keio SDM over other programs because I wanted to learn how to manage large and complex systems. I am glad I did so; SDM’s curriculum teaches me full-fledged knowledge of systems thinking and design thinking. I would like to mention three characteristics, among many others, that make SDM special. The first characteristic is its diversity. SDM offers a wide variety of courses ranging from technology, politics, and social sciences to many other subjects for its students to earn across disciplines. Students from such diverse backgrounds as music, architecture, and management study together and many of them are working students. I believe it is a plus for my career to learn from their experiences. The second is internationality. SDM students come from all walks of life and every corner of the world. The third is the depth and the breadth of knowledge that the faculty members possess. Many teachers go out of their way to help students even after school.

SDM studies present a unique perspective through which to understand the complexity of the world.

I did my bachelor’s degree in electrical engineering in my home country of Zambia and had heard about the System Design and Management program at MIT when I stumbled upon Keio SDM in an online search. After successfully applying for a Japanese government scholarship, I joined the master’s program in September 2016. I am now a Ph.D. student, and both programs have exceeded all of my initial expectations. At Keio SDM, you put problem-solving skills into practice through research, gaining plenty of hands-on experience along the way. During my master’s program, I had to balance coursework with my research in Cambodia, where I had a real difference in people’s lives. In the Ph.D. program, on the other hand, I have been identifying unique, unprecedented issues that add value to my field of study. And you can apply to Keio SDM with just the click of a button, no matter where you are in the world. If you’re looking for a life-changing experience, I would say there’s no better place than Keio SDM.
There are a number of scholarships for international students, such as Keio “Design the Future” Award for International Students, as well as different scholarships provided by Keio University, Japan Student Services Organization (JASSO), the government of Japan, and other private foundations. All scholarships aim to enable personally and academically outstanding students in need of financial assistance to continue and focus on their studies and research. Most of the scholarships are targeted towards regular students who are on a student visa and studying at their own expense. Please follow the link below for more information regarding scholarships.


The answer is yes, you can still be admitted to Keio SDM even if you do not speak Japanese. We give entrance examinations in English; and students can choose to complete the course using only English. Having recognized the importance of internationally competent staff from the very beginning of its establishment, Keio SDM has administrative staff members who can assist in multiple languages. As for the faculty, those who have been educated and/or trained overseas and have sufficient language abilities are assigned to assist international students. If you wish, you can learn basic Japanese by taking Japanese classes. The university has well-established Japanese language education which began in the 1950s.


You can send your application documents by post regardless of whether you reside inside or outside of Japan. You will be called for an interview if you pass the document review. There is no need to come to Japan for an interview as we can conduct it online, using technologies such as Skype™, for those who reside outside of Japan. Please refer to our examination literature for more details.

Keio University has a number of reasonable accommodations for international students. In the vicinity of Hiyoshi Campus, where Keio SDM is located, there are a number of dormitories with easy access to the campus, such as Shimoda Student Village (designed for international students), dormitories for both Japanese and international students. Each dormitory has Japanese residence assistants who facilitate interactions among students and provide daily life support especially for international students. For international students who wish to rent apartments privately, the university can introduce real-estate agents who can provide services in English. We also have an insurance scheme whereby the university acts as the guarantor.


International students take on a variety of career paths after Keio SDM; some join Japanese companies; some return to their countries to work; and others go on to further education. Almost half of our Japanese students are company employees, and many of the faculty members come from private firms. As a student you also have ample opportunities to connect with companies through the Design Project and other research work. Many international students have made use of these opportunities to get jobs with Japanese companies. Because Keio SDM graduates are internationally-minded and capable of navigating in different cultures, many also find opportunities within international enterprises.

Many alumni are now playing active roles in various fields and industries. The network you will encounter by studying at Keio SDM will be an asset to your future business and career. We have seen new business started up through participation in our network.

Keio SDM has collaborated with Massachusetts Institute of Technology (U.S.), Stanford University (U.S.), Delft University of Technology (the Netherlands), and the University of Adelaide (Australia) to develop an educational method for design projects. At Keio SDM we are putting this into practice in one of the subjects, the “Design Project”, thereby continuing to improve upon the educational method. We also have international exchange programs. The partner schools include: MIT, Stanford, Delft University of Technology, the University of Adelaide, National Institute of Applied Sciences Toulouse (France), the Politecnico di Milano (Italy), Swiss Federal Institute of Technology Zurich (Switzerland), and Purdue University (U.S.). Every year a number of students come from these schools to study at Keio SDM.
Access: A one-minute walk from Hiyoshi Station
(Tokyu Toyoko Line, Tokyu Meguro Line, or Yokohama Municipal Subway Green Line)

- 18 minutes by express train from Shibuya Station to Hiyoshi Station.
  (16 minutes by commuter limited express)
- 12 minutes by express train from Yokohama Station to Hiyoshi Station.
  (10 minutes by commuter limited express)
- 14 minutes by train from Shin-Yokohama Station to Hiyoshi Station via Kikuna Station.
- Limited express trains on the Tokyu Toyoko Line do not stop at Hiyoshi Station.