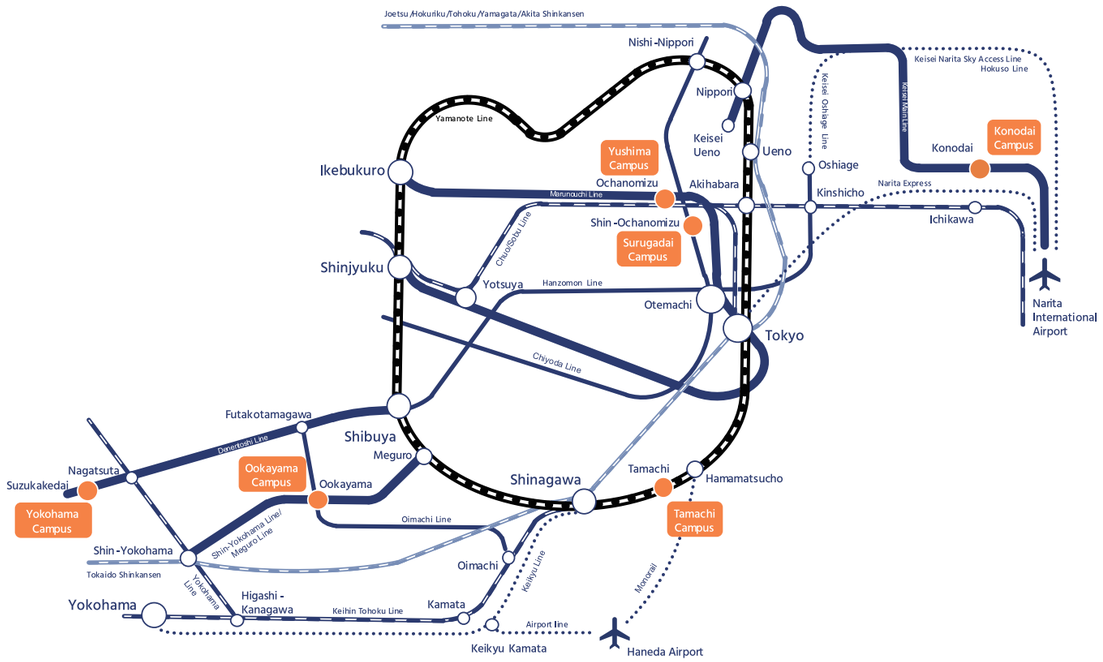

Contact for the School of Computing: inquiry@comp.isct.ac.jp

Institute of SCIENCE TOKYO

School of Computing

School of Computing

Creating the Future of the Information Society

Information is an elusive concept. To observe, analyze, and make use of it, researchers have developed a wide range of studies involving advanced mathematical theories, high-performance computing technologies, artificial intelligence, and more. The School of Computing conducts research on information from both scientific and engineering perspectives — ranging from advanced theories to cutting-edge technologies. As more and more kinds of information can now be processed by computers, we are able to use information more efficiently than ever before. However, there still remain many truths to be uncovered and technologies to be developed regarding information itself and the computations that process it. There must also be countless applications we have yet to imagine. At the School of Computing, we aim to advance information science and technology that can contribute to society, pursuing fundamental truths about information while developing innovative technologies. In recent years, as concrete examples of such efforts, the School of Computing has played a central role in establishing university-wide research organizations that bring together experts from related fields — the Center for Cybersecurity Research and Education (founded in 2016) and the Data Science & Artificial Intelligence Research Group for Social Good (DSAI) (founded in 2019). These centers serve as core hubs for research and education in cybersecurity, data science, and artificial intelligence, which are among the most important challenges in modern society.

Jun Miyazaki,
Dean of the School of Computing

The field of information is indispensable in modern society. The School of Computing covers the entire spectrum of information studies, from the fundamentals to practical applications. Its research spans from basic investigations into the nature of information and computation to studies on computer hardware, software, and artificial intelligence, as well as the application of information technologies in diverse areas such as medicine, biology, and materials science. By promoting education in information studies and advancing cutting-edge research, the School contributes to the development and maturation of future society, industry, and scientific and technological research.

Tokyo Institute of Technology merged with Tokyo Medical and Dental University on October 1, 2024, and became Institute of Science Tokyo.

School of Computing

Why Study at the School of Computing?

Advancing Technology and Exploring the Truths of Information

You can study the fundamental theories of mathematical and computer sciences that are essential for analyzing large-scale and diverse information. Through this study, you will not only learn practical technologies but also engage with the pursuit of fundamental truths about information and the computations that process it.

Artificial Intelligence: The Heart of Robotics Development

In the socially prominent field of robotics, you can be involved in developing artificial intelligence, which lies at the core of robots. You will learn both the theory and practice necessary to develop perception and knowledge-acquisition abilities, enabling computers to become smarter based on experience.

Envisioning the Future that Connects Humans and Computers

You can explore cutting-edge technologies for designing and developing the hardware and software needed to create information systems and services. From the fundamentals to practical applications, you will learn how to build information systems that enable closer collaboration between humans and computers.

The organizational structure of the School of Computing

Undergraduate (1st year)

School of Computing

In the first year of the undergraduate program at the School of Computing, students take common first-year courses together with peers from other Schools. From the second quarter onward, they begin to study specialized courses in computing. In Literacy of Computing, students learn about the relationship between computing, technology, and society, and improve their presentation and debate skills. In Foundations of Computing, they study the basic theories of informatics that form the basis for advanced learning in later years. In Processes for Creation in Science and Technology, students are introduced to cutting-edge topics in information and computer science from both academic and industrial fields. At the beginning of the program, the School also organizes a ***Bus Seminar***, a short off-campus retreat where first-year students can interact with classmates and faculty members.

Common first-year courses

- Basic Science and Technology Courses (Mathematics, Physics, Chemistry, and Informatics)
- Frontiers in Science and Technology
- Humanities and Social Sciences Courses
- English Language Courses
- Interdisciplinary Liberal Arts Courses
- Second Foreign Language Courses

First-year specialized courses

- Processes for Creation in Science and Technology
- Literacy of Computing
- Foundations of Computing (1, 2, 3)

Undergraduate (2nd-4th year)

Department of Mathematical and Computing Science

Develop the ability to understand and analyze information and information systems that support modern society using scientific and mathematical approaches.

The Department of Mathematical and Computing Science cultivates individuals who can excel in the field of information science by fully utilizing their scientific and mathematical skills. Specifically, the program develops students who can systematically learn the mathematical theories necessary to logically and mathematically understand various phenomena and apply them in real-world contexts, mathematically grasp the essence of diverse problems and identify effective solutions, and possess the ability to design and implement information systems that can process and solve these problems.

Unique aspects of the curriculum

- An approach that utilizes new mathematics through the use of computers
- An approach based on operations research, statistics, and machine learning to solve real-world problems through mathematical modeling
- An approach in computer science that treats information processing as computation, applying mathematics and logic, as well as methods for designing computer systems that implement these computations

[2nd year]

Set and Topology I, Exercises in Set and Topology I, Applied Calculus, Set and Topology II, Exercises in Set and Topology II, Algebra, Complex Analysis, Linear Algebra and Its Applications, Fundamentals of Probability, Mathematical Statistics, Introduction to Computer Science, Introduction to Algorithms and Data Structures, Theory of Automata and Languages, Programming I, Computer Systems

[3rd year]

Vector and Functional Analysis, Applied Theory on Differential Equations, Lebesgue Integration, Numerical Analysis, Mathematical Optimization, Discrete Mathematics, Markov Analysis, Information Theory, Combinatorial Algorithms, Programming II, Operating Systems, Mathematical Logic, Theory of Computation, Compiler Construction, Research Opportunity in Laboratories

[4th year]

Independent Research Project, Advanced Independent Research Project

Department of Computer Science

Aiming to build a prosperous and safe future society, acquire a broad knowledge of computers.

In the Department of Computer Science, students acquire a wide range of specialized knowledge, from systematic theories of information to areas such as software, hardware, multimedia, artificial intelligence, machine learning, and bioinformatics. The program is not designed merely to teach programming skills or to create casual computer users. Instead, it aims to cultivate individuals who deeply understand computer technologies, from their fundamental principles to practical applications across all social systems, and who can excel as leading researchers and engineers on the global stage.

Unique aspects of the curriculum

- Essential and fundamental technologies are carefully selected from the vast field of information technology and offered in a highly refined form.
- Emphasis is placed on practical exercises and workshops to cultivate hands-on skills and the ability to apply knowledge.
- Nearly all specialized courses are offered as required electives, allowing students to choose according to their career goals.

[2nd year]

Fundamentals of Computing, Probability Theory and Statistics, Procedural Programming Fundamentals, Advanced Procedural Programming, Automata and Formal Languages, Switching Circuit Theory, Machine Learning, Logic in Computer Science, Assembly Language, Functional Programming Fundamentals, Data Structures and Algorithms, Artificial Intelligence, Object-Oriented Programming, Introduction to Combinatorial Game Theory, Creative Programming Projects

[3rd year]

Computer Logic Design, Fundamentals of Optimization, Databases, System Programming, Computer Networks, System Analysis, Pattern Recognition, Biological Data Analysis, Parallel Programming, Software Design and Quality, Numerical Analysis, Computer Architecture, Workshop on System Design, System Software, Compiler Construction, Dynamical Systems, Control Systems, Time Series Modeling, English Writing and Presentation Skills (Computer Science), Research Opportunity in Laboratories

[4th year]

Independent Research Project, Advanced Independent Research Project

Graduate (Master's/Doctoral)

- Graduate Major in Mathematical and Computing Science
- Graduate Major in Computer Science
- Graduate Major in Artificial Intelligence
- Graduate Major in Energy Science and Informatics
- Graduate Major in Science and Technology for Health Care and Medicine

Doctoral

- Graduate Major in Materials and Information Sciences
- Graduate Major in Super Smart Society

Graduate Major in Mathematical and Computing Science

An unquenchable spirit of inquiry that envisions and challenges the foundations of information a hundred years ahead.

The master's program provides students with a broad and advanced education in mathematical and computer science theories, fostering creative and practical professionals who can apply, extend, and deepen these theories. Graduates are expected to possess the ability to formulate and analyze complex modern problems in global society through mathematical modeling, and to design and implement computer systems that realize and process these solutions.

The doctoral program provides students with a profound foundation in mathematical and computer sciences, enabling them to deepen or originate their own research. It fosters individuals with the ability to propose and lead innovative approaches to solving complex challenges in modern society, and to become globally competent leaders who advance and drive the frontiers of science and technology in both academic and industrial fields.

Graduate Major in Computer Science

Becoming Professionals Who Pioneer the Future of the Information Society

The master's program provides students with a broad range of advanced expertise in the theories and technologies essential to modern information infrastructure, information systems, and information services. It fosters individuals who can design and implement innovative solutions to real-world challenges in relation to people and society, and who can make meaningful contributions on a global scale.

The doctoral program provides students with a broad range of advanced expertise in the theories and technologies essential to modern information infrastructure, information systems, and information services. It fosters individuals who can design and implement innovative solutions to real-world challenges in relation to people and society, and who can take the lead globally in advancing their academic and professional fields.

Graduate Major in Artificial Intelligence

Fostering Leaders in the Field of Artificial Intelligence

The master's program provides students with a broad foundation in artificial intelligence, including basic mathematics, computational theory, modeling, and machine learning, and cultivates their ability to apply these skills to collaborate with team members from diverse backgrounds to solve complex problems.

The doctoral program provides students with advanced expertise in artificial intelligence, enabling them to accurately define problems in the complex real world and lead teams composed of members with diverse backgrounds and areas of specialization to solve these challenges.

Graduate Major in Energy Science and Informatics

Interdisciplinary Professionals Developing Information Technologies that Contribute to a Sustainable Society

The master's program provides students with the skills to advance information technologies essential for achieving a sustainable society — such as artificial intelligence, distributed systems, system control, programming languages, optimization, and security — and cultivates interdisciplinary professionals capable of collaborating with domestic and international experts in the energy sector to solve complex challenges.

The doctoral program provides students with the ability to advance information technologies essential for achieving a sustainable society — such as artificial intelligence, distributed systems, system control, programming languages, optimization, and security — cultivating interdisciplinary professionals who can lead their field globally and collaborate with domestic and international experts in the energy sector to identify and solve complex challenges.

Graduate Major in Materials and Information Sciences

Creating Outstanding Talent by Integrating Materials Science and Information Science to Shape the Future

In today's world, where industrial innovation is essential for building a sustainable society, there is a growing need for professionals who can skillfully handle both materials and information and connect manufacturing to societal services. This course links materials and information, enabling students to leverage information science and think from multiple and comprehensive perspectives to advance original research at the intersection of materials and information. The course cultivates such multifaceted professionals and is open only to doctoral students.

Graduate Major in Science and Technology for Health Care and Medicine

Deeply Understanding People and Striving to Realize a Sustainable and Safe Society

The master's program provides students with a strong foundation for understanding people and society, combined with expertise in science and engineering. It cultivates individuals with broad perspectives, deep analytical thinking, comprehensive decision-making abilities, a solid sense of ethics and technical judgment, and an international outlook, equipping them with the skills to define and solve problems in advanced technological development and academic research.

The doctoral program provides students with specialized knowledge for deeply understanding people and society, along with advanced and interdisciplinary expertise in science and engineering. It cultivates individuals who can drive innovative and challenging cutting-edge research and development, possess the imagination to pioneer new fields, and demonstrate international leadership.

Graduate Major in Super Smart Society

Cultivating and Producing Professionals Who Pioneer New Fields Through Interdisciplinary Integration

This interdisciplinary course features two main components: ***Interdisciplinary research***, in which students develop their own research by gaining new ideas and perspectives from faculty and students in different fields to address societal challenges, and a ***society-linked curriculum***, which provides practical experience through collaboration with a consortium promoting a super-smart society, involving leading companies, research institutions, local governments, and ministries and agencies in the real world. This course is open only to doctoral students.