



University of Tsukuba



Graduate School of Science and Technology
Degree Programs in Systems
and Information Engineering
Master's/Doctoral Program in Computer Science

<https://www.cs.tsukuba.ac.jp/english/>

Information Mathematics and Modeling

Intelligent Software

Software Systems

Computer Architecture

Media Engineering

Intelligent Systems

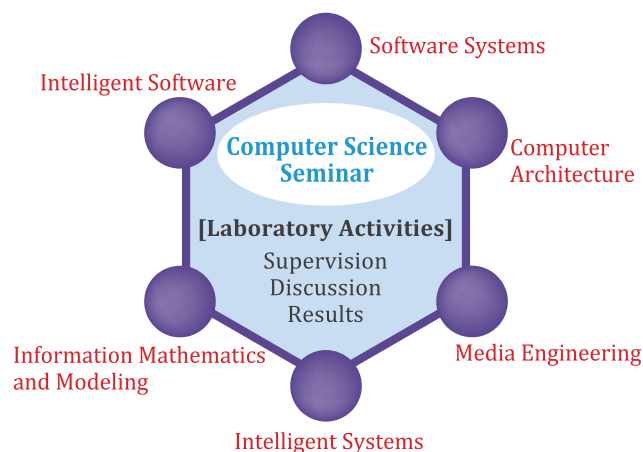
Master's / Doctoral Program in Computer Science

We offer a wide variety of educational programs, including an English program that allows students to obtain a master's degree in English only, and a program that certifies completion through a practical IT curriculum.

Research fields range from basic technologies such as computers, networks, and security for the generation, processing, and use of "information", to application technologies such as Web applications, user interfaces, voice and image recognition, and high-performance computing.



Degree Programs in Systems and Information Engineering
Master's / Doctoral Program in Computer Science



Admission policy

Individuals with basic knowledge in the fields of information and mathematics and with a strong desire to acquire specialized knowledge, technical skills, basic R&D skills, and practical skills in the information and mathematics fields at graduate school.

Curriculum policy

Our curriculum provides expertise and research ability in information mathematics and modeling, intelligent software, software systems, computer architecture, media engineering, intelligent systems, and a wide range of basic knowledge and ethics in the engineering field. Through research guidance toward master's / doctoral dissertation, we provide education to foster human resources who can find and solve problems from a wide perspective in multiple fields of science and technology.

Diploma policy

Upon satisfying the requirements for completion of the master's program / doctoral program prescribed in the University of Tsukuba Graduate School and related Regulations, and after submitting a dissertation or a specific research report, a master's / doctoral (engineering) degree will be awarded to those who have been certified by the final examination to have acquired general knowledge and skills as specified in this program.

Study model

The Information Science Course aims at acquiring advanced technologies in the information field, whereas the Human-centered AI Course aims at acquiring specialized knowledge, skill, activity, and ethic related to the application of AI and information technologies for solving international social issues.

Achievements evaluation

In order to complete their master's / doctoral program, students are encouraged to study systematically by confirming the achievement status of knowledge and skills (general purpose / dedicated competence) to be acquired. Achievement evaluation results will be treated as part of the final examination conducted along with the dissertation review.

Education program

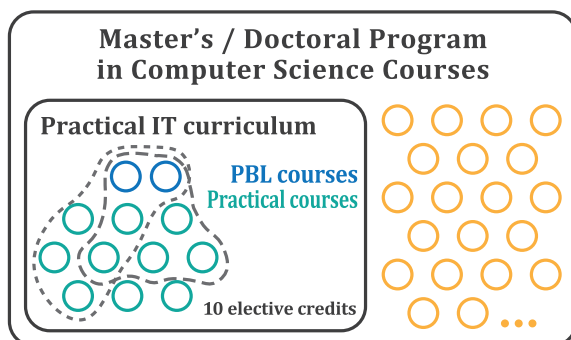
In the Master's / Doctoral Program in Computer Science, we offer a variety of educational programs, including an English program that allows students to obtain a master's degree in English only, and a program that certifies completion through a practical IT curriculum.

Computer Science English Program

By taking courses offered in English on the designated list, students can earn all the credits required for a master's degree in English only. The CSE program aims to foster the development of qualified international researchers.

Practical IT curriculum

This curriculum aims to develop practical skills in software and system development. It consists of PBL (project-based training) courses solving problems that occur in the real world through group work, as well as practice-oriented courses that supplement them.



International Joint Master's Program

This program organizes master's dual degree programs with the University of Grenoble-Alpes (France) and the University of Bochum (Germany).

Students attend lectures and do research at the University of Tsukuba and partner schools, with the aim to obtain master's degrees from both the University of Tsukuba and partner schools.

International Program for Japanese Government Scholarship Students

We have been conducting "International Program for Promoting AI Social Implementation," supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Successful applicants of the special entrance examination will be adopted as university-recommended MEXT scholarship recipients.

Early Completion Doctoral Program

This is a program for working people who have a certain level of research achievements and abilities to complete a standard 3-year doctoral program in one year at the earliest. Based on research achievements accumulated during their work activities, students receive guidance from supervisors to write and complete their doctoral dissertations.

Center for Artificial Intelligence Research (C-AIR)

The Center for Artificial Intelligence Research was opened in April 2017 to promote advanced research and education on AI. Through the cooperation of numerous faculty members, this center supports and organizes the activities and collaborations between AI research groups from different fields in the University, promoting the interdisciplinarity which is key to the University of Tsukuba's research vision.

Advancement of the "Human supporting AI" research towards Society 5.0

Various big data of University of Tsukuba
University of Tsukuba research centers

Division of Fundamental Research in Artificial Intelligence

Math Algorithms Machine Learning	Healthcare Wellness & Sports
Big Data Cyber Security	Medical Sci. Material Sci.
Service Engineering Human Technology	Society Mobility
Quantum Information Science	Humanities Trustworthy AI

Division of Applied Research

Corporate research
institutes
Universities

RIKEN
Center for Advanced
Intelligence Project
NAIST
Artificial Intelligence
Center

Research institutions in
Tsukuba Science City
Local government

Advancing to a super-smart society

Various underlying technologies leading to future social systems














<Demonstration model city Tsukuba>
Research leading to social
implementation







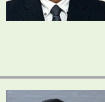





AI / Big data
Advanced utilization technologies
High value-added data

Faculty members and their research areas




Information Mathematics and Modeling

Faculty	Detailed Description of Research Field
	KAWABE Tohru Control design: Theory and applied research in Biologically Inspired Technology, Computational Intelligence based Control, Robust Control, etc.
	SAKURAI Tetsuya Artificial Intelligence, Mathematical Algorithms
	SHIKANO Yutaka Quantum Information Science, Metrology, Measurement System, Theoretical Physics
	TAKAHASHI Yasuhiro Quantum Information Science, Quantum Complexity Theory, Quantum Algorithm
	TOKUNAGA Ryuji Chaos, fractals and bifurcation theory. Computer amusement oriented elementary technologies
	AIHARA Ikkyu Mathematical modeling of animal behavior and its applications: Nonlinear dynamics, Field recordings of animal calls, Sensor networks
	IMAKURA Akira Numerical analysis: Numerical algorithms for solving linear systems and eigenvalue problems
	SANO Yoshio Discrete Mathematics, Graph Theory, Combinatorics
	HIRATA Yoshito Nonlinear time series analysis (theory and its applications), 3D reconstruction of chromosome structure
	FUTAMURA Yasunori Numerical analysis, High performance parallel algorithm, Parallel solver for large-scale linear systems and eigenvalue problems, Parallel numerical software
	DIPANJYOTI Paul Computer Vision, Explainable AI (XAI), Multi-modal Learning, AI in Health, Streaming data, Natural Language Processing
	MORIKUNI Keiichi Numerical linear algebra, numerical algorithms, matrix analysis, numerical analysis
	BOGDANOVA Anna Machine Learning, Distributed Data Analysis, Privacy, Interpretability














Intelligent Software

Faculty	Detailed Description of Research Field
	OHYA Akihisa Intelligent robots and sensing: Mobile robots working in humans' daily life environment, real world sensory information processing, networked robotics, cooperative multiple mobile robots
	KAMEYAMA Yukiyoishi Programming languages and symbolic logic: type system, metaprogramming, programming logic, program verification
	SHIZUKI Buntarou Human-computer interaction: Visual programming and interaction techniques for end users
	NAGATANI Keiji Field Robotics: Robotic technology designed for outdoor applications, utilization of sensing and robotic technologies at natural disaster sites, and automated construction planning at earthwork sites
	MISUE Kazuo Information visualization: visual interface, visual analytics, network visualization, graph drawing
	TAKAHASHI Shin User interface software, Ubiquitous computing, Computer-supported cooperative work (CSCW)
	MIZUTANI Tetsuya Program theory and musical informatics: Logical foundation of verification and analysis of realtime intellectual program systems and musical information
	VASILACHE Simona Software engineering, software development process, human computer interaction; intercultural communication, global software engineering
	KAWAGUCHI Ikkaku Human Computer Interaction, Remote Communication Support, Communication Robot
	YOROZU Ayanori Intelligent robot for human-harmonious collaboration, Task and motion planning, Human and environmental sensing, Field robotics

Software Systems









Faculty	Detailed Description of Research Field
	AMAGASA Toshiyuki Database system, data engineering: XML/RDF Database, social media, and scientific database
	KATO Kazuhiko System software: Distributed system, cloud computing, operating system, cyber-physical system, software security
	KITAGAWA Hiroyuki Database systems and data engineering : Information integration, data mining, sleep data analysis, big data, stream processing
	ABE Hirotake System Software, Distributed Systems, Computer Security, Computer Network
	OYAMA Yoshihiro Computer security, system software, operating systems, virtualization
	SHIOKAWA Hiroaki Database systems and data engineering
	SHINJO Yasushi Operating systems, distributed systems, virtualization, privacy protection, decentralized social networking services
	CHEN Hanxiong Database system, knowledge-based system, e-education, information retrieval, knowledge discovery and data mining
	TSUGAWA Sho Network mining, Social network analysis, Computational social science
	HASEBE Koji Multi-agent systems: Game theory, Mathematical logic, Formal methods, Autonomous distributed systems
	MACHIDA Fumio System dependability, dependability evaluation, stochastic models, system design optimization
	BOU Savong Database system, data engineering, scientific database, XML/RDF Database
	HORIE Kazumasa Machine Learning, Neural Network, Pattern Recognition, Biological Signal Processing

Computer Architecture




Faculty	Detailed Description of Research Field
	TAKAHASHI Daisuke High-performance computing: High-performance numerical algorithms on parallel computers and performance evaluation
	TATEBE Osamu Parallel and distributed system software, data-intensive computing, and high performance computing
	NUKADA Akira High Performance Computing, Performance Optimization, GPU Computing
	BOKU Taisuke Massively parallel and high performance computing systems: Massively parallel computer architecture, cluster computing and its system software, high performance computing system including GPU/FPGA accelerators
	YAMAGUCHI Yoshiaki Reconfigurable architecture, computing, and highly efficient systems with high performance and low-power consumption applied to AI, encryption, IoT, and scientific applications
	KIMURA Shigetomo Information communication engineering: Process algebra, network protocols and performance evaluation of communication systems
	SATO Akira Design and operation technology for academic network systems, information systems and computing systems
	SHOUNO Kazuhiro Analog circuit: Integrated analog CMOS circuits, measurement of frequency characteristics of integrated RC polyphase filters, and synthesis of active / passive complex filters
	TADANO Hiroto Numerical analysis: Numerical algorithms for large scale linear systems. Parallel computing for eigenvalue problems
	YAMAGIWA Shinichi Algorithms, Software/Hardware and Applications of Embedded System, Data Compression, Distributed System, Computer Architecture and Sports Engineering
	TOMIYASU Hiroshi Making better use of significantly progressing microprocessors for parallel computer architecture after Age of vector supercomputers and massively parallel computers
	KANAZAWA Kenji VLSI Engineering, Reconfigurable computing, Accelerator for hard computation problems using reconfigurable LSI
	SANNOMIYA Shuji Autonomous, parallel, and distributed processor architecture: Research on data-driven chip-multi-processor based on self-timed elastic pipeline








	Fujita Norihisa High Performance Computing, Accelerator, GPU Computing, Reconfigurable Computing, High Performance Interconnection
---	---

Media Engineering






Faculty	Detailed Description of Research Field
	KAMEYAMA Keisuke Learning, adaptive information processing, signal / image encoding, and applications to retrieval and restoration
	KUDO Hiroyuki Image processing and medical imaging: Image and video processing, imaging science, medical imaging (CT,PET,MRI) and computer-aided diagnosis, intelligent image sensing, music and sound processing, mathematics of inverse problems
	TAKIZAWA Hotaka Intelligent image processing: medical image recognition, computer-aided diagnosis, computer vision, 3-D object recognition
	MITANI Jun CG and CAD: Geometric modeling, Human computer interface, Computational origami
	YAMADA Takeshi Speech and acoustic information processing: speech emotion recognition, sound scene understanding, and multi-channel sound source enhancement
	KANAMORI Yoshihiro Computer graphics (CG), rendering, deep learning, image editing techniques, CG applications for industry
	SUZUKI Taizo Multi-perception media processing: Signal analysis, data compression, perceptual security, computer vision
	ENDO Yuki Computer graphics, image synthesis and editing techniques, image recognition, data mining, machine learning, deep learning

Intelligent Systems

Faculty	Detailed Description of Research Field
	KUNIHIRO Noboru Cryptography, Information Security, Quantum Computation, Cryptanalysis, Cryptographic Protocol
	FUKUI Kazuhiro Pattern recognition and computer vision: Face recognition, 3D object recognition, human sensing, robot vision
	YAMAMOTO Mikio Search algorithms for symbol sequence data, especially methods using trie structures based on double arrays

	AKIMOTO Yohei Black Box Optimization and its Applications: probabilistic model based optimization, evolutionary computation, hyper-parameter optimization in machine learning, reinforcement learning, application of information geometry to algorithm design
	IIZUKA Satoshi Computer graphics, image processing, image editing, computer vision, machine learning
	IGARASHI Yasuhiko Machine learning, Multivariate analysis, Sparse modeling, Data-driven science, Measurement informatics, Materials informatics
	INUJI Takashi Natural Language Processing: Information extraction and knowledge acquisition from natural language data, opinion mining, and sentiment analysis
	YE Xiucui Feature selection for high dimensional data, Clustering, Machine learning, Data analysis, Classification, Network computing
	ARANHA Claus Research on Evolutionary Computation: Optimization, Program Generation, Procedural Generation, Intelligent Agents and Artificial Life
	FUKUCHI Kazuto Mathematical statistics and machine learning: statistical inference, statistical learning, fairness and privacy in machine learning, data mining

Professors of Cooperative Graduate School

Faculty	Detailed Description of Research Field
	KOBAYASHI Takumi (National Institute of Advanced Industrial Science and Technology) Statistical pattern recognition and machine learning : Deep learning, Feature extraction and representation, Image classification, Video classification, Multidimensional sensor data analysis
	SATO Yutaka (National Institute of Advanced Industrial Science and Technology) Ubiquitous vision, Robot vision, Stereo omnidirectional system (SOS)
	NAKADA Hidemoto (National Institute of Advanced Industrial Science and Technology) Parallel computing, distributed computing, grid, cloud, machine learning
	TANIMURA Yusuke (National Institute of Advanced Industrial Science and Technology) Parallel and Distributed Storage, Large-scale Data Processing, Edge-to-Cloud Computing, AI Computing Infrastructure
	NAKATA Ayako (National Institute for Materials Science) Application of Computational Mathematics and Machine Learning to Materials Science (Quantum chemistry, First-principles simulation)

Courses

Master's Program

Common courses:

Research in Computer Science A
Research in Computer Science B
Research in Computer Science C
Research in Computer Science D
Instructional Design
Data Analysis
Experiment Design in Computer Sciences
Program Development on Embedded System
Special Lecture on Social Innovation by ICT
Internship I
Internship II
Human-centered AI A
Human-centered AI B
Research Presentation in Computer Science I
Research Presentation in Computer Science II

Software Systems:

Concurrent Systems
Data Engineering I
Data Engineering II
Advanced Course in Distributed Systems
Topics in Computer Science I

Intelligent Systems:

Advanced Course in Statistical Language Modeling
Advanced Course in Computational Linguistics
Image Recognition and Understanding
Special Lecture on Cryptography I
Special Lecture on Cryptography II

Information Mathematics and Modeling:

Advanced Nonlinear Systems
Advanced Course in Computational Algorithms
Special Lecture on Numerical Simulation
Systems and Control
Systems and Optimization
Basic Computational Biology
Selected Topics in Quantum Algorithms

Computer Architecture:

Advanced Parallel Processing Architecture
Advanced Course in High Performance Computing
Advanced Computer Network
Advanced Circuit Engineering

Project Practice:

Project Practice Workshop
Initiative Project I
Initiative Project II

Intelligent Software:

Advanced Course in Programming Languages
Advanced Course in Program Theory
Intelligent Sensory Information Processing
Special Topics in Computer Human Interaction I
Special Topics in Computer Human Interaction II
Principles of Software Engineering
Topics in Computer Ethics
Advanced Course on Cryptography

Media Engineering:

Advanced Course in Signal and Image Processing I
Advanced Course in Signal and Image Processing II
Advanced Course in Signal and Image Processing III
Advanced Course in Speech Media Engineering
Advanced Course in Computer Graphics
Adaptive Media Processing

Special Lectures on Selected Topics:

Topics in Computational Science I

Computer Science English Program

Common Courses:

Research in Computer Science A
Research in Computer Science B
Research in Computer Science C
Research in Computer Science D

Elective Courses:

Advanced Course in Computational Algorithms
Special Lecture on Numerical Simulation
Basic Computational Biology
Principles of Software Engineering
Topics in Computer Ethics
Data Engineering I
Advanced Course in High Performance Computing
Adaptive Media Processing
Experiment Design in Computer Sciences
Topics in Computational Science I
Human-centered AI A
Human-centered AI B

Campus-wide Courses for Graduate Students:

Computational Science Literacy
High Performance Parallel Computing Technology for Computational Sciences

Practical IT Curriculum

Common courses:

Project Practice Workshop
Initiative Project I
Special Lecture on Social Innovation in ICT
Internship I
Advanced Course in Cyber Risk
Principles of Software Engineering
Topics in Computer Ethics
Program Development on Embedded System
Special Lecture on Cryptography I
Special Lecture on Cryptography II

Doctoral Program

Common courses:

Advanced Research in Computer Science A
Advanced Research in Computer Science B
Advanced Seminar in Computer Science
Cross-Disciplinary Seminar in Computer Science
Research Internship I
Research Internship II
AI Applied Research Internship
Advanced Research Presentation in Computer Science I
Advanced Research Presentation in Computer Science II
Advanced Research Presentation in Computer Science III

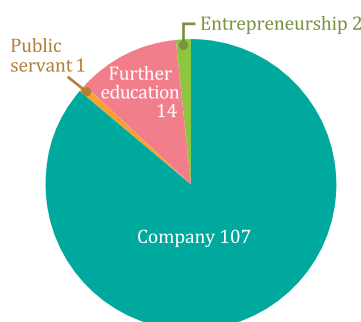
Career Paths after Graduation

Approximately 90% of students who complete the Master's Program at our Graduate School secure employment in various industries, while around 10% pursue further studies in the Doctoral Program. Graduates of the Doctoral Program typically find positions as researchers (including postdoctoral positions) or faculty members in corporate research institutes, R&D departments, universities, and other research institutions.

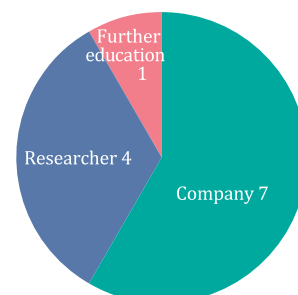
Major Careers after Master's Program

Alibaba Group Holding, Amazon Web Services Japan, BrainPad, CAPCOM, CyberAgent, Dai Nippon Printing, Dai-ichi Life Insurance, DeNA, DWANGO, Fixstars, Fujitsu, Hitachi, Internet Initiative Japan, KDDI, Konami Group, Kubota, LG Electronics, LINE, Marubeni IT Solutions, Mizuho Bank, MonotaRO, MUFG Bank, Murata Manufacturing, NEC, Nomura Research Institute, Nomura Securities, NTT DATA, NTT DOCOMO, Recruit, Renesas Electronics, SEGA SAMMY HOLDINGS, Simplex Holdings, Sony Global Solutions, Sony Semiconductor Solutions, Tata Consultancy Services Japan, teamLab, Tokyo Electron Group, Weathernews, Yahoo Japan, etc.

Major Careers after Master's Program



Major Careers after Doctoral Program



Major Careers after Doctoral Program

Aoyama Gakuin University, CyberAgent, GMO Internet Group, Hunan University, King Abdullah University of Science and Technology, Lenovo Japan, Nagoya University Hospital, NIMS (National Institute for Materials Science), Nissan Motor, Pharmaceutical University, Rakuten Group, Renesas Electronics, RIKEN (The Institute of Physical and Chemical Research), Ruprecht-Karls-Universität Heidelberg, Sohag University, Yahoo Japan, etc.

Financial support

We provide financial support through scholarships, tuition and admission fee waivers, loan repayment exemptions, and teaching assistant positions. In recent years, we have particularly enhanced support for doctoral programs. All doctoral students receive assistance equivalent to half their tuition and admission fees for three years through research assistant positions or similar opportunities, with outstanding students receiving full tuition coverage for the same period. Additionally, alongside the traditional stipend support provided by the Japan Society for the Promotion of Science (JSPS) Research Fellowships, we offer financial aid through public funding programs such as JST's "Support for Pioneering Research Initiated by the Next Generation," providing exceptional doctoral students with stipends covering living expenses and research costs.

Admission information

In our program, the following entrance examinations are conducted for applicants for master's program and doctoral program, respectively.

Examination for Master's Program applicants

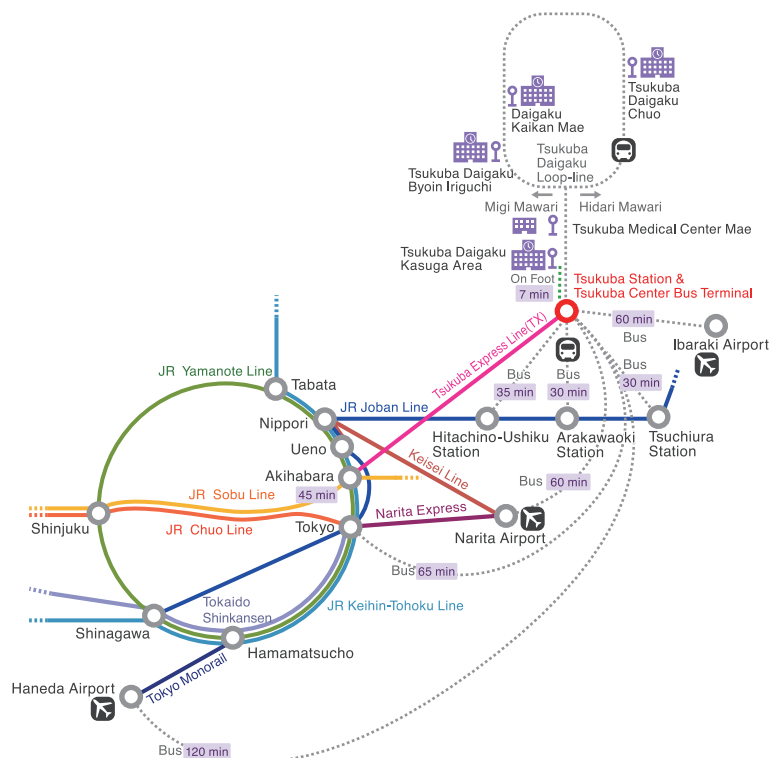
We carry out three examinations: recommended entrance examination (July), general entrance examination (August), and general entrance examination (January to February). In addition, at the same time as the general entrance examination, we also carry out special selection of working individuals. In the entrance examination for the Master's Program in Computer Science, in order to make it easier for external applicants and working individuals to take the examination, oral examinations are emphasized. In the recommendation entrance examination, those who have been recommended by their affiliated university etc. are required to take the oral examination only, which assesses their knowledge in their specialized field and their aspirations. In the general entrance examination, an additional oral examination of basic subjects is required, and English proficiency is evaluated by TOEIC, TOEFL or IELTS scores (there is no written examination). As a special arrangement for those living overseas, we also carry out an exam in January to February. Screening and selection are based on submitted application documents and an oral examination with an online conference system.

More information regarding admission

The information above is subject to change. For the latest information on entrance examinations, please check the Master's/Doctoral Program in Computer Science website (<https://www.cs.tsukuba.ac.jp/english/>) and application guidelines.

Examination for Doctoral Program applicants

We carry out three general entrance examinations in July (enrollment in October), in August (enrollment in April), and in January to February (enrollment in April or October). In the doctoral course, we actively promote the acceptance of working individuals; at the same time as conducting general entrance examinations, we also conduct special selections for working individuals. In each of the entrance examinations, in addition to oral examinations which evaluate previous research, as well as post-admission research plans and motivation, English proficiency is assessed by conducting part of the oral examination in English. Moreover, those who have passed the special selection for working individuals can apply for "early completion doctoral program for working individuals", based on their work/education experience etc., and they can obtain a doctoral degree in a minimum of one year. As a special arrangement for those living overseas, we also carry out two exams in July (enrollment in October), in August (enrollment in April), and January to February (enrollment in April or October). Screening and selection are based on the submitted application documents and an oral examination with an online conference system.



Access

Tsukuba Express

It will take 45 minutes by the rapid service from Akihabara Station to Tsukuba Station. Take a local bus bound for "Tsukuba Daigaku Loop-line Migi Mawari" from Tsukuba Station to Daisan Area Mae. It will take about 10 minutes.

JR Joban Line

It will take around 60 minutes from Tokyo or Ueno Station to Hitachino Ushiku, Arakawaoki or Tsuchiura Station. Take a local bus bound for "Tsukuba Daigaku Chuo" from these stations to Daisan Area Mae. It will take 30-35 minutes. In case of the bus for "Tsukuba Center", please transfer at "Tsukuba Center" bus terminal to a bus bound for "Tsukuba Daigaku Chuo" or "Tsukuba Daigaku Loop-line Migi Mawari". It will take around 10 minutes.

Highway Bus

It will take around 75 minutes from Tokyo Station Yaesu South Exit to "Daigaku Kaikan Mae" by bus bound for "Tsukuba Daigaku" and 10 minutes walking. In case of the bus for "Tsukuba Center", please transfer at "Tsukuba Center" bus terminal to a bus bound for "Tsukuba Daigaku Chuo" or "Tsukuba Daigaku Loop-line Migi Mawari". It will take around 10 minutes.

By Car

Driving directions from Joban Highway → Exit "Sakura-Tsuchiura" IC → Proceed to Tsukuba (Turn left) → Turn right at Sasagi Intersection → Follow "Higashi Odori" Avenue → Turn left at the signal "Tsukuba Daigaku Chuo Iriguchi" (About 8km)

By Air

From Narita Airport

By Bus: Take a bus bound for "Tsukuba Center". It will take around 60 minutes. See above from Tsukuba Center bus terminal.

By Train: Take Keisei Line for Ueno Station. It will take around 45 minutes by Skyliner Airport Express. See above from Ueno Station.

From Haneda Airport

By Bus: Take a bus bound for "Tsukuba Center". It will take around 120 minutes. See above from "Tsukuba Center" bus terminal.

By Train: Take monorail to JR Hamamatsuchō Station, or Keiikyū Line to JR Shinjuku Station. It will take 20-23 minutes. Use JR Yamanote Line to Tokyo, Akihabara or Ueno Station. See above from these stations.

From Ibaraki Airport

Take a bus bound for "Tsukuba Center". It will take around 60 minutes. See above from "Tsukuba Center" bus terminal.

Contact

address Room 3F900, Building F, Third area,
University of Tsukuba, Tennodai 1-1-1, Tsukuba,
Ibaraki 305-8573, Japan

tel +81-(29)-853-5530

fax +81-(29)-853-5206

e-mail inquiry@cs.tsukuba.ac.jp

