University of Tsukuba

筑波大学

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

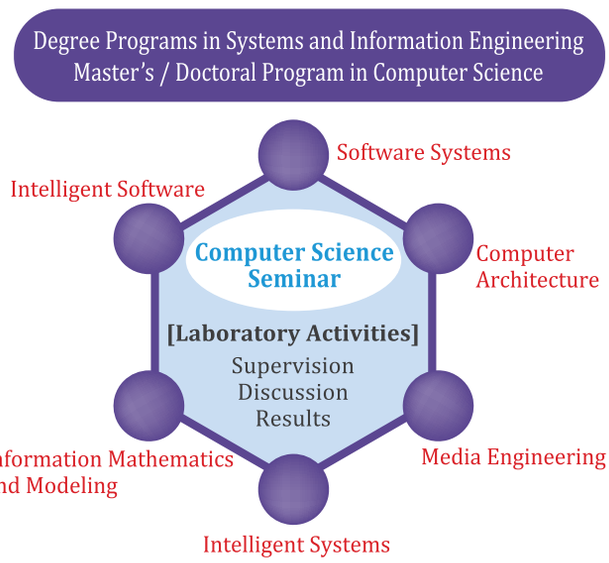
Media Engineering

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.



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

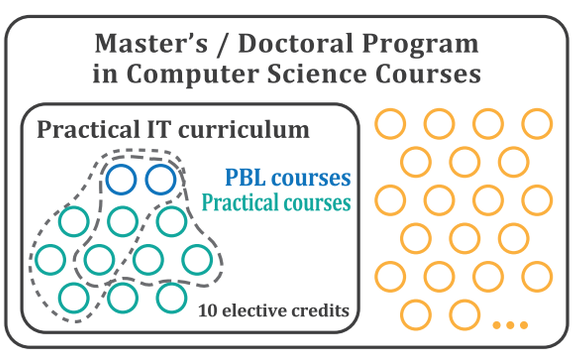
In the Master’s / Doctoral Program in Computer Science, we offer a variety of educational programs, including an English program that allows students to obtain a master’s degree in English only, and a program that certifies completion through a practical IT curriculum.

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

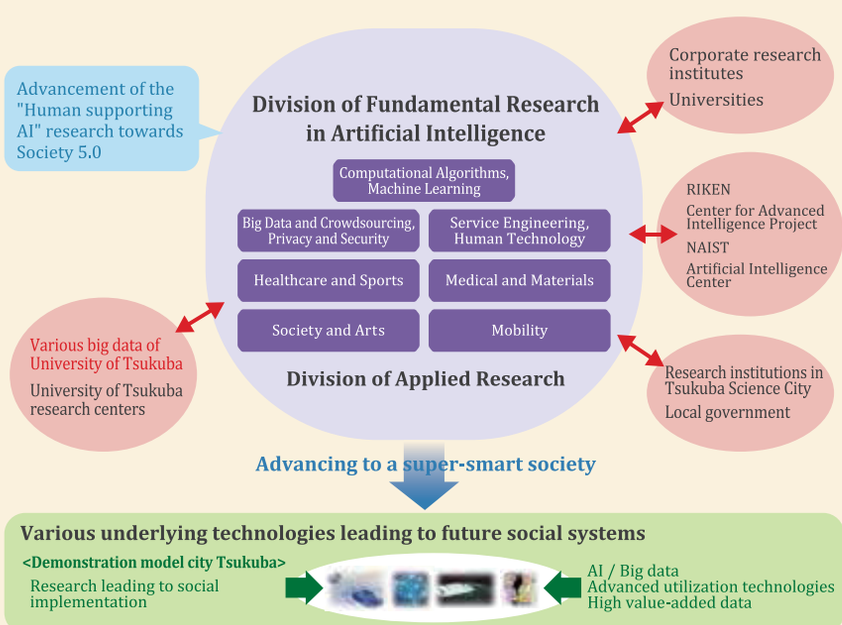
We have been conducting "International program for human-centered AI society," for the university-recommended Japanese government scholarship students. This program is supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

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.

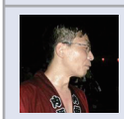
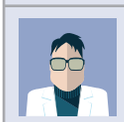
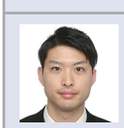
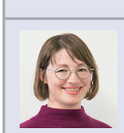
Center for Artificial Intelligence Research (C-AIR)

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.



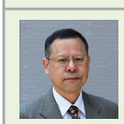
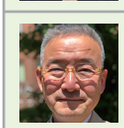
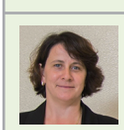
Faculty members and their research areas

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.
	KUNO Takahito Mathematical optimization: Numerical algorithms for globally solving nonconvex optimization problems.
	SAKURAI Tetsuya Computational Mathematics, Numerical Mathematics for Computers, Parallel Computing Algorithms for upercomputers, Algorithms for Large-scale Data Analysis, Computational Science, Mathematical Software.
	SHIKANO Yutaka Quantum Information Science, Metrology, Measurement System, Theoretical Physics.
	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.
	CAI Dong Sheng Multimedia using artificial life theory. High performance computing and parallel computing for space simulation. Imaging using chaos and fractals.
	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.
	MORIKUNI Keiichi Numerical linear algebra, large sparse matrix computations, preconditioning algorithms for Krylov subspace methods, least squares problems, singular linear systems.
	BOGDANOVA Anna Machine Learning, Distributed Data Analysis, Privacy, Interpretability.

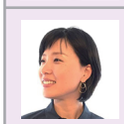
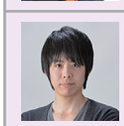
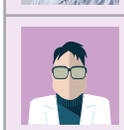
	NGUYEN Dai Hai Machine Learning, Statistics, Bioinformatics, Cheminformatics.

Intelligent Software

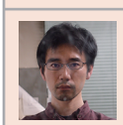
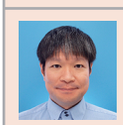
Faculty	Detailed Description of Research Field
	OHYA Akihisa Intelligent robots and sensing: Mobile robots working in humans' daily life environment, real world sensory information processing, networked robotics, cooperative multiple mobile robots.
	KAMEYAMA Yukiyoshi Programming languages and symbolic logic: type system, metaprogramming, programming logic, program verification.
	SHIZUKI Buntarou Human-computer interaction: Visual programming and interaction techniques for end users.
	MISUE Kazuo Information visualization: visual interface, visual analytics, network visualization, graph drawing.
	UNNO Hiroshi Program verification: model checking, type systems, program analysis, automated theorem proving.
	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.
	OKA Mizuki Social Media Analysis, Web Science, Artificial Life.
	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.

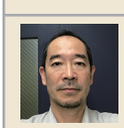
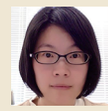
Computer Architecture

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 Yoshiki 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.
	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.
	KOBAYASHI Ryohei FPGA applications, Reconfigurable Computing System, GPU-FPGA Cooperative Computation.
	SANNOMIYA Shuji Autonomous, parallel, and distributed processor architecture: Research on data-driven chip-multi-processor based on self-timed elastic pipeline.
	TADANO Hiroto Numerical analysis: Numerical algorithms for large scale linear systems. Parallel computing for eigenvalue problems.
	Fujita Norihisa High Performance Computing, Accelerator, GPU Computing, Reconfigurable Computing, High Performance Interconnection.

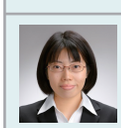
Media Engineering

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.
	SAKAI Ko Computational vision: representation of shape, perception of 3D structure, figure-ground segregation, cortical representation, cognitive neuroscience, and psychophysics.
	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.
	INUI Takashi Natural Language Processing: Information extraction and knowledge acquisition from natural language data, opinion mining, and sentiment analysis.
	YE Xiucai 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.
	SATOH 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. Cloud computing. Grid computing. E-science applications.
	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

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
Computational Vision Science
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

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
Interdisciplinary Laboratory Internship I
Interdisciplinary Laboratory Internship II
AI Applied Research Internship

Prospects after graduation

Students who have completed a major in computer science are expected to play a central role in today's information society. Approximately 90% of the students who completed the master's program in computer science and obtained a master's degree are employed by various companies, and about 10% of the students have advanced to the doctoral program. Students who have completed the doctoral program and obtained a Ph.D. work in corporate R & D departments, universities or national institutes. In some cases, they continue their research as postdoctoral fellows.

Major careers after Master's Program

■ **2022**

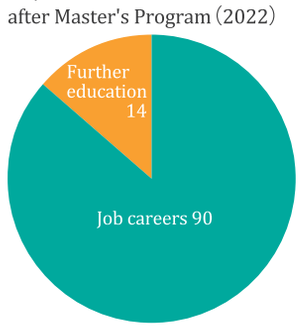
Job careers

Yahoo / Softbank / KADOKAWA Connected / Hitachi / KDDI / Nomura Research Institute / Sky / Rakuten / NTT Group / Sony / NEC / Fujitsu / Amazon Web Services / Olympus / Panasonic / Toshiba / Tokyo Electron / Fujifilm, etc.

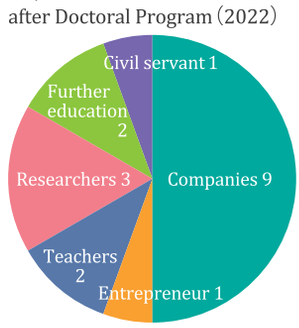
Further education

University of Tsukuba / Tokyo Institute of Technology / Nagoya University

Major careers
after Master's Program (2022)



Major careers
after Doctoral Program (2022)



Major careers after Master's Program

■ **2022**

Job careers

LINE / RevComm / DJI / Taisei Corporation / Sony / NTT Laboratories / Hitachi / Ruprecht Karl University / Zhejiang University of Finance and Economics / AIST / Kobe University / Nagoya University / Japan Society for the Promotion of Science

Financial support

As financial support, various scholarships, exemption from admission and tuition fees, exemption from repayment of scholarships, and employment of teaching assistants are available.
In recent years, University of Tsukuba has enhanced its support for doctoral students in particular. For all students enrolled in the doctoral course, half of the entrance and tuition fees are supported for three years through the employment of research assistants. For students with excellent academic records, full tuition fees are supported for three years.
University of Tsukuba has been selected by MEXT for the "University Fellowship Program for the Creation of Innovation in Science and Technology", and JST for the "Support for Pioneering Research Initiated by the Next Generation". As a result of this program, in addition to the existing support as a JSPS Postdoctoral Fellow, the university provides financial support (living expenses and research expenses) to outstanding doctoral students.

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 / Doctoral 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) 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.

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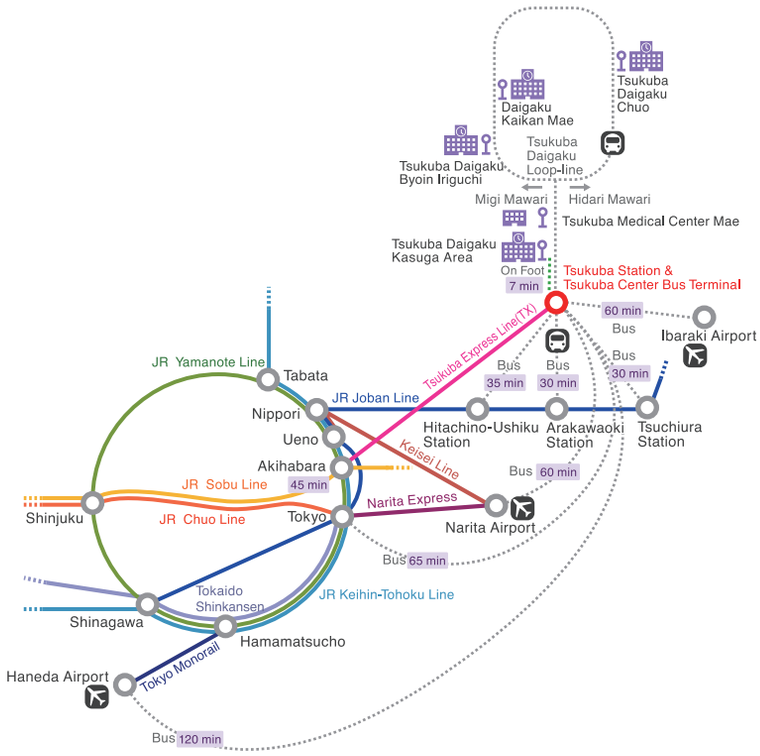

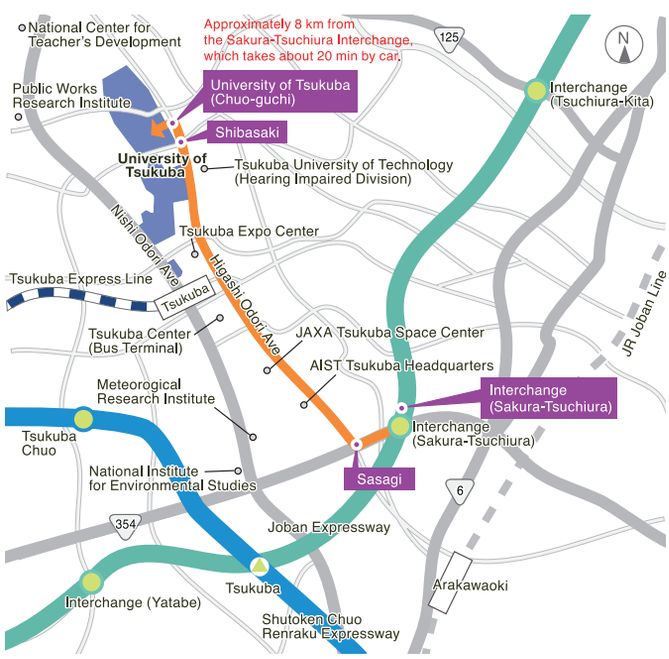

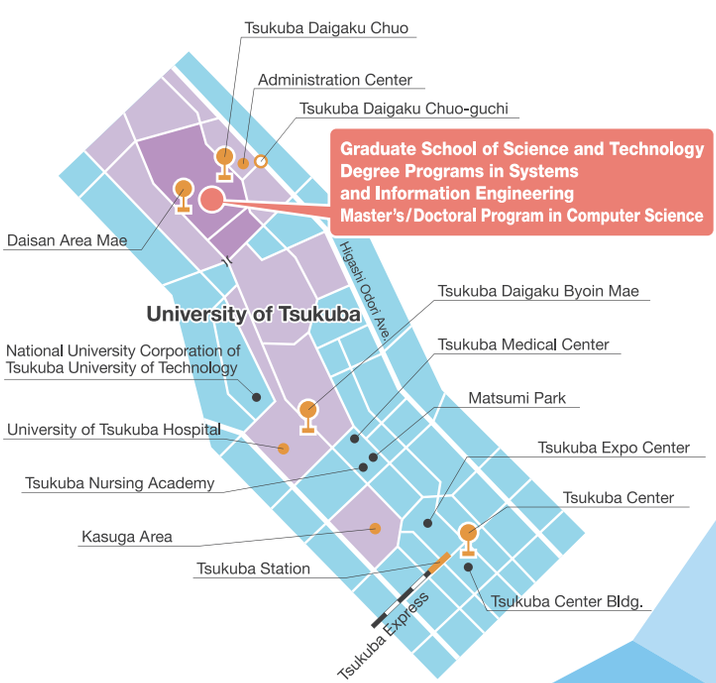

Access

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 Hamamatsucho Station, or Keikyu Line to JR Shinagawa 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

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