

1-1-3. Improvement of Education Quality

Hiroshima University (National) Graduate School of Advanced Science and Engineering

◆ **Program name**

Division of Advanced Science and Engineering,
Transdisciplinary Science and Engineering Program
(Environmental and Natural Sciences / Development Science
Field)

◆ **Degrees:**

- a. Master of Philosophy
- b. Master of Engineering
- c. Master of International Cooperation Studies

◆ **Credit and years needed for graduation:**

30 credits, 2 years

◆ **Address:**

1-5-1 Kagamiyama, Higashi-Hiroshima-shi, Hiroshima,
739-8529, Japan



Features of University <http://www.hiroshima-u.ac.jp/en>

Hiroshima University (HU) was established by combining eight existing institutions in May 1949 under the National School Establishment Law. Later in 1953, the Hiroshima Prefectural Medical College was also added to the new HU. Some of these higher educational institutions already had brilliant traditions and histories of their own. Although these educational institutions suffered a great deal of damage due to the atomic bomb, which was dropped on Hiroshima on August 6, 1945, they were reconstructed and combined to become the new HU. In addition, Graduate Schools were established in 1953. The new HU has risen from the ruins of war like a phoenix, which is in fact the University's symbol.

HU has a long history of accepting international students. This commenced before World War II. As of May 2023, HU has over 13,000 students including approximately 1,700 international students from about 80 countries.

For details about education and student's life at Hiroshima University, please visit the following websites.

Education and Students Life: https://www.hiroshima-u.ac.jp/en/explore_hu

- Learning: https://www.hiroshima-u.ac.jp/en/explore_hu/learning
- Timeline: https://www.hiroshima-u.ac.jp/en/explore_hu/timeline
- Support: https://www.hiroshima-u.ac.jp/en/explore_hu/support
- Life: https://www.hiroshima-u.ac.jp/en/explore_hu/life
- Photos: https://www.hiroshima-u.ac.jp/en/explore_hu/photo
- Videos: https://www.hiroshima-u.ac.jp/en/explore_hu/videos

Features of Graduate School <https://www.hiroshima-u.ac.jp/en/adse>

The Graduate School of Advanced Science and Engineering was established as a flexible education and research organization by reorganizing the existing graduate schools and major courses for science and engineering in Hiroshima University. It consists of two major courses (Division of Advanced Science and Engineering that contains 15 diploma programs, Joint International Master's Program in Sustainable Development (Hiroshima University and Leipzig University)).

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The Division of Advanced Science and Engineering was established as a school for science and engineering to develop human resources who will take a central role in the exploration of unknown scientific principles and technological and scientific innovation in the future. Because securing advanced knowledge and expertise is an essential foundation for human resource development, the Division of Advanced Science and Engineering consists of the following programs: science programs for developing wide range of fundamental expertise, i.e. (1) Mathematics Program, (2) Physics Program, (3) Earth and Planetary Systems Science Program, and (4) Chemistry Program; engineering programs, i.e. (5) Applied Chemistry Program, (6) Chemical Engineering Program, (7) Electrical, Systems, and Control Engineering Program, (8) Mechanical Engineering Program, (9) Transportation and Environmental Systems Program, (10) Architecture Program, and (11) Civil and Environmental Engineering Program; and (12) Informatics and Data Science Program which is a diploma program for systematically developing not only the data processing and analysis capabilities required for various areas of expertise related to science, engineering, and other fields but also knowledge and skills related to informatics that are the basis of capabilities needed to meet social needs.

In addition, the Division of Advanced Science and Engineering includes the (13) Quantum Matter Program in which students can study basic materials science, condensed material physics, and electronic engineering beyond the border. Additionally, the (14) Transdisciplinary Science and Engineering Program provides education and research activities based on the existing specialized fields of science and engineering while integrating the existing academic frameworks beyond the border from a nature- and human-oriented bird's eye view. This allows Japanese and foreign students to cope together with complicated social needs and challenges in Japan and abroad without considering the difference of their specialized fields. Furthermore, in 2021, (15) Smart Innovation Program has been newly provided to allow the university and industries to closely cooperate to promote research and development activities for social implementation and develop sophisticated human resources for the industries.

Features of the Program <https://tsep.hiroshima-u.ac.jp/>

The Transdisciplinary Science and Engineering (TSE) Program aims to develop a "knowledge-intensive society" by merging the existing academic systems beyond the border among them from a bird's eye view while being based on the core area of expertise such as the natural environment, natural disasters, integrated physics, information system, media, and development technology. To achieve the aim, the Program educates students to obtain expertise and research skills for environmental problems, environmental risks related to resources and energy problems, elemental sciences, and systems regarding areas from the materials for life and ecosystems, and environmental information related to the system in which mankind coexists with information technology and the media from a nature-oriented point of view. Students will also develop an ability to contribute to society based on understanding and insight for the natural science and information science throughout the Program. In addition to this, from a human-oriented point of view, the Program encourages students to research the theories and analysis methods for the development of human-oriented technology for development issues in developing nations such as urban development, community development, industrial promotion, and environment protection to obtain an ability to globally contribute to sustainable development.

In addition, the Program is organized as a multi- and inter-disciplinary diploma program in which Japanese and foreign students with various academic backgrounds study together to realize innovation domestically and internationally in cooperation with advanced professionals in various fields. The Program develops researchers and educators who understand a human-oriented point of view and have obtained research abilities, expertise, professional skills, and cross-disciplinary points of view for the areas of core expertise and related areas such as the natural environment, natural disasters, integrated physics, information system, media, and development technology. The program will also foster technocrats and advanced professionals who have a bird's eye view and problem-solving capability based on understanding of diverse cultures and global insight.

The program consists of two fields, Development Science field and Environmental and Natural Sciences field.

Key Features of Education

(1) Education Programs in English

We believe it is important to develop international professionals capable of writing academic articles and reports, communicating and conversing in English. Therefore, all lectures and seminars are provided in English.

(2) Systematic and Interdisciplinary Curriculum

We offer a systematic and interdisciplinary curriculum to produce specialists who can contribute to international development and cooperation in ways that cut across established academic disciplines. We offer integrated education and research programs in Urban and Transportation Engineering, Energy Science, Risk Management, Biological Science, and Environmental Health Science to develop interdisciplinary and global perspectives.

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Special Education Programs

We offer special education programs designed to improve the qualifications and skills of students who plan to work in the field of international cooperation. The main features of these programs are as follows.

(1) Global Environmental Leaders Special Education Program

One of our aims is to establish a center for training environmental leaders capable of identifying problems and formulating strategic solutions at national or local levels through interdisciplinary and international perspectives. The global issue of reducing carbon emissions is an example of such a problem and the need for solutions. Another aim is to provide a platform for collaboration between industry, government and academia to promote cutting-edge environmental research and create coherent practical solutions for environmental issues on a global scale that is not limited to developing countries. We seek to provide value-added knowledge to those engaged in international cooperation. Achieving these aims requires addressing five areas: urban system design to prevent global warming, wise use of biomass resources, environmental impact assessment, policy and institutional design and environmental education. Our intention is for developing countries to work hand in hand with Japan to develop international environmental leaders, a task that we will undertake in an effective and practical manner.

For more details, refer to

https://www.hiroshima-u.ac.jp/en/smart_society/gels

(2) Formation of a Strategic Center for Global Internship (G.ecbo)

HU is currently promoting the “Formation of a Strategic Center for Global Internship” (commonly known as the “G.ecbo program”) following the 2007 adoption of the Support Program for Improvement of Graduate School Education. G.ecbo is a practical education program that includes pre- and post-internship training designed to achieve viable outcomes from student internships. The following types of internships are available:

- (1) overseas internships, in which students go to a university or organization outside Japan.
- (2) domestic internships, in which foreign students go to a Japanese company or organization.
- (3) third-country internships, in which students from developing countries go to institutions in other developing countries.
- (4) follow-up research internships, in which students in doctoral programs go back to countries where they have previously worked.

Necessary Curriculum to Obtain the Degrees

https://tsep.hiroshima-u.ac.jp/?page_id=216

To obtain a Master’s degree, JDS Fellows need to satisfy the following requirements:

Minimum of 30 credits through program work;

Submission of a master’s thesis.

All students need to decide their own research topic and supervisors (one head-supervisor and two sub-supervisors) at the beginning of the first semester. Under the head-supervisor’s advice, students will choose subjects to enroll and start preparations for a master’s thesis.

List of subjects offered in 2024 academic year is attached. Students will choose subjects mainly from “Transdisciplinary Science and Engineering Program”.

(URL: https://momiji.hiroshima-u.ac.jp/syllabusHtml_en/2024_E90114_en.html)

List of faculty members capable of guiding JDS Fellows

<https://www.hiroshima-u.ac.jp/en/adse/staff/transdisciplinary-science-and-engineering>

https://tsep.hiroshima-u.ac.jp/?page_id=63

Students need to decide their own research topic and supervisors (one head-supervisor and two sub-supervisors) at the beginning of the first semester. Under the head-supervisor’s advice, students will choose subjects to enroll and start preparations for their master’s thesis.

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【Transdisciplinary Science and Engineering Program (Development Science Field)】

Subject · Specialty	Position	Name	Research Subject
Environmental Planning	Professor	NISHINA, Daisaku (Retirement at the end of March, 2026)	Living environment planning in buildings and urban area: water environment, landscape and environmental psychology
Transportation Engineering, Transportation Planning	Professor	FUJIWARA, Akimasa (Retirement at the end of March, 2026)	Transportation planning methods, evaluation of transport policies, and sustainable development and transport
Urban and Data Science	Professor	FENG, Tao	Urban planning, smart mobility, travel behaviour, transport network analysis, data driven technology, mobility in built environment, spatial planning, urban environment analysis, decision making in smart energy, big data & machine learning for urban research
Environmental Health Science	Associate Professor	KASHIMA, Saori	Epidemiological study focusing on environmental health problems, Development of health care system based on spatial statistics
Sustainable Architecture	Professor	KUBOTA, Tetsu	Building and urban environmental science for achieving sustainable development in the Global South
Urban Environmental Science	Professor	SHARIFI, AYYOUB	Urban Climate Change Mitigation and Adaptation; Nature-based Solutions; Green Infrastructure; Urban Microclimate, Urban Resilience; Sustainable Urban Forms; Assessment Tools.
Risk Management Technology	Professor	CHIKARAISHI, Makoto	Smart urban infrastructure, transportation planning, urban planning, travel behavior analysis, travel survey design, transport network analysis, resilience research, risk analysis
Biomass Energy Technology, Botany Resources for the Future	Professor	TRAN, Dang Xuan	Development of biomass energy technologies and application to developing countries Agricultural ecology and development of sustainable agricultural technologies
Ecosystem Conservation and Management Science	Professor	HOSAKA, Tetsuro	Research and education on ecology and ecosystem management
Energy Science and Technology	Professor	LEE, Han Soo	Renewable energy evaluation and management in developing countries, Numerical models for coastal hazards · disaster prevention · mitigation, Evaluation of climate changes on natural hazards and renewable energy environment.
Transportation Engineering, Transportation Planning	Associate Professor (Special Recognition)	SEIKE, Miho	Large enclosed-space fire safety: evacuation behavior, disaster prevention plan, thermal fume behavior, risk analysis, decision making of evacuation start
Environmental Genomics and Ecology, Environmental Microbiology	Professor	MARUYAMA Fumito	Our research focuses on understanding how microorganisms interact with each other, with their symbiotic hosts and with the environment, both experimentally and through big data analysis. Topics includes the relationship between climate change and microbes, genomic dynamics of pathogenic microbes in habitats, and pathogenic microbes and antibiotic

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Subject · Specialty	Position	Name	Research Subject
			resistance in air and water environments.
Conservation of biological resources	Associate Professor	WATANABE Sonoko	Research and education on vegetation and landscape ecology of SATOYAMA ecosystems with a wide range of conservation issues. -Geographic distribution patterns of rural landscapes -Biodiversity conservation in SATOYAMA
Global Change and Biodiversity	Assistant Professor	HISANO Masumi	To assess and mitigate climate change impacts on forest ecosystem functioning (biomass and carbon dynamics) and biodiversity by big data analysis To develop wildlife-friendly farming and urban landscape planning for biodiversity conservation To understand ecology and behaviour of wildlife (mammals and birds)
Agricultural Chemistry (Agrochemistry)	Assistant Professor	NGUYEN VAN QUAN	Our group focuses on researching natural products and their applications in agriculture and human health protection, specifically in preventing chronic diseases such as diabetes, obesity, and cancer. In addition, we conduct metabolomic studies to decode the reaction mechanisms of crop varieties under various weather and environmental pressures.

【Transdisciplinary Science and Engineering Program (Environmental and Natural Sciences)】

Subject · Specialty	Position	Name	Research Subject
Environmental Earth Sciences	Professor	ONODERA, Shin-ichi	Hydrologic transport of earth surface materials: hydrogeomorphology and biogeochemistry
Environmental Earth Sciences	Associate Professor	OZAWA, Hisashi	Thermodynamics of the global climate and fluid systems, dissipative structures of non-equilibrium systems
Environmental Earth Sciences	Associate Professor	SAITO, Mitsuyo	Environment-geology-ecosystem interactions in terrestrial to coastal waters
Environmental Earth Sciences	Associate Professor	YOKOYAMA, Tadashi	Reaction and transport relevant to rock weathering
Physics of Complex Matter	Professor	INUI, Masanori	Static and dynamic structures and physical properties of structurally disordered matter
Physics of Complex Matter	Professor	TODA, Akihiko	Non-Equilibrium Phenomena in Polymer Physics and Phase Transitions

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Subject · Specialty	Position	Name	Research Subject
		(Retirement at the end of March 2025)	
Physics of Complex Matter	Associate Professor	TAGUCHI, Ken	Crystal growth and pattern formation of soft matter
Physics of Complex Matter	Associate Professor	TANAKA, Shinpei	Physics of complex systems, such as active matter and non-equilibrium ordering
Physics of Complex Matter	Associate Professor	MUNEJIRI, Shuji	Physics Education Research, Molecular Dynamics Simulation of Liquids
Physics of Complex Matter	Associate Professor	KAJIHARA, Yukio	Physics of Disordered Materials (liquids and glasses)
Physics of Correlated Matter	Professor	ISHIZAKA, Satoshi	Quantum information theory concerning e.g. quantum entanglement and quantum communication
Physics of Correlated Matter	Professor	HATAKENAKA, Noriyuki (Retirement at the end of March 2025)	Foundation of quantum mechanics and quantum information sciences including quantum computer and quantum artificial intelligence
Physics of Correlated Matter	Professor	OGITA, Norio	Condensed matter physics under multiple extreme conditions (very high pressure, ultra-low temperature, strong magnetic field) by laser spectroscopy method
Physics of Correlated Matter	Professor	HIGASHITANI, Seiji	Condensed Matter Theory on Superconductivity and Superfluidity
Physics of Correlated Matter	Associate Professor	HASEGAWA, Takumi	Lattice dynamics in condensed matter investigated by inelastic scattering of Quantum beam and first-principles calculation
Physics of Correlated Matter	Associate Professor	SUGIMOTO, Akira	Experimental-nanoscale physics on superconductors and related materials with scanning probe microscopy/spectroscopy
Physics of Correlated Matter	Assistant Professor	KATAYAMA Haruna	Circuit quantum gravity theory concerning e.g. circuit analogue black holes
Information and Media Sciences	Professor	INAGAKI, Tomohiro	Computational approach to strong coupling and gravitational systems, Computer based learning materials

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Subject・Specialty	Position	Name	Research Subject
Information and Media Sciences	Associate Professor	KODAMA, Mei	Research on Media Communication Services
Information and Media Sciences	Associate Professor	WATANABE, Hidenobu	Cybersecurity, Confidential Computing
Information and Media Sciences	Lecturer	IWASAWA, Kazuo	Studies on information system and information security education

Supervisor below in charge of plural programs takes charge of the program in the following table, including Environmental and Natural Sciences Field of this program.

Graduate School /Program	Position	Name	Research Subject
Graduate School of Advanced Science and Engineering / Mechanical Engineering Program	Professor	ICHIKAWA, Takayuki	Research and Development of energy conversion materials
Graduate School of Advanced Science and Engineering / Mechanical Engineering Program	Professor	MATSUMURA, Yukihiro	Research and development of biomass utilization technology
Graduate School of Advanced Science and Engineering / Quantum Matter Program (Physics Field)	Professor (Special Recognition)	MIYAOKA, Hiroki	Research and development of hydrogen production, hydrogen storage, and material conversion
Graduate School of Integrated Sciences for Life	Professor	ISHIDA, Atsuhiko	Studies on regulation of enzymes involved in cellular signaling
Graduate School of Integrated Sciences for Life	Professor	YAMADA, Toshihiro	Conservation of organisms based on ecology
Graduate School of Integrated Sciences for Life	Associate Professor	OMURA, Hisashi	Studies on chemical interactions between plants and insects.
Graduate School of Integrated Sciences for Life	Professor	VILLENEUVE, Masumi	Thermodynamic studies on interfacial behavior of biorelated substances using model cell membranes, basic science related to drug delivery.
Graduate School of Integrated Sciences for Life	Associate Professor	NEHIRA, Tatsuo	Research of structural organic chemistry in life science.
Graduate School of Integrated Sciences for Life	Professor	TAKEDA, Kazuhiko	Environmental dynamics and analysis of trace compounds and reactive oxygen species in the atmosphere and hydrosphere.
Graduate School of Integrated Sciences for Life	Associate Professor	NAKABAYASHI, Miyabi	Behavior and ecology of wildlife

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Academic Schedule

(Reference)

Fall Semester (October 1 - March 31) <In case of the schedule in AY2024>

October 1	Entrance Ceremony, Orientation
October 2 - February 5	Classes
Early October	International Student Orientation (University-wide)
Mid October	Deadline of Class Registration
November 5	University Anniversary Day
December 26 - January 5	Winter Vacation
February 6 - March 31	End-of- Academic-Year Holidays

Spring Semester (April 1 - September 30) <In case of the schedule in AY2024>

April 1 - April 7	Spring Vacation
April 8 - August 1	Classes
Mid-April	Deadline of Class Registration
End of July	Thesis Submission
Early-August	Thesis Defense
August 2 - September 30	Summer Vacation
September 20	Graduation Ceremony

Facilities <https://www.hiroshima-u.ac.jp/en/centers>

Residence

We provide apartments for international students at a reasonable rent. Students can get support in English from Hiroshima University Co-op when they apply for the apartments, have troubles and so on.

Also, a public apartment called "Sun Square Higashi-Hiroshima" is available to international students.

Library

Our library has nearly a collection of 30,000 titles of books and journals. Our collection is mainly focused on economics of development, education development, international relations and Asia regional culture development. "World Bank Information Kiosk" is placed for the purpose of introducing active discussions in academic area about the policy and actions of the World Bank. Students can access to "World Development Indicators Online" in our library. Flag ship publications, project reports, brochures and publications from the World Bank Tokyo Office are also available.

JDS fellows have full access to 5 other libraries on campus which has approximately 3,300,000 materials in its collection. Holding a huge collection of books and electronic journals, with a total combined area of 26,000 square meters, Hiroshima University Library System comprised of 5 libraries is one of the largest in the country.

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Other facilities

Within the campus, we have welfare facilities such as various cafeteria, a travel agency office, stores, book shops and a barber shop. Hiroshima University also has a post office and a university health service center on the campus. The International Center provides mental counseling service to international students in English.

Message for Applicants

HU is a research-based university. In line with this policy, we require a thesis for the fulfillment of the master's degree, which is different from the coursework-based curriculum typically found in professional schools. It is not a very easy task to compile a master's thesis based on independent research. In fact, students need to spend significant time and resources. However, it is expected that this experience will enable you to acquire specialized academic and practical knowledge in your area of specialization. To ensure that you can pursue research of a high standard that achieves a good result, at the time of joining our program we require applicants to have a good command of English. Some knowledge of civil engineering or agricultural, or environmental science studies for designing a sustainable infrastructure is also highly desirable.

Our aim is to foster advanced specialists who can contribute to solution of the issues of the sub-program and component, such as improvement of social infrastructure from the viewpoint of hardware and software sides, and improvement of urban and regional problems by considering interaction between industrial location, land use, environment, human life, disaster prevention, etc., we provide the special program for students to obtain these knowledge and skills through theoretical and empirical lessons with practical cases.

In the campus surrounded by abundant nature in the suburbs of Hiroshima city, you can give your full attention to your study. You're each and every experience here will serve as an excellent base for your further steps as a professional government official. We welcome you to Hiroshima University.