Master's Program in Materials Innovation

Master of Engineering

Program Educational Objectives

The Master's Program in Materials has committed tie-ups with research institutes in the Tsukuba region to cultivate human resources who are active in the international society using the innovation ability that is achieved by applying leading-edge materials sciences and technologies while looking into nature deeply and grasping global scale problems from the perspective of materials science and engineering.

Graduate Profile	The Program seeks to cultivate human resources who can lead the future-oriented innovative energy materials and also the innovation in electronics so that they can contribute to the creation of social values. He or she should have the capabilities to design, analyze and create materials and grasp global scale social needs to be active in the international society by getting their English proficiency into full use.

Diploma Policy

The degree of Master of Engineering is commenced to those who have fulfilled the requirements for the completion of the Master's programs, as set out in the Graduate School Regulations of the University of Tsukuba and related university regulations, and who are deemed to have the following competences.

	Competences	Evaluation perspectives
Knowledge and Skills	1. Knowledge application competence: Ability to contribute to society with advanced knowledge	①Can you apply knowledge gained through research and other activities in society? ②Can you identify new problems, even in other fields of expertise, based on broad knowledge?
	2. Management competence: Ability to appropriately address challenges from broad standpoints	①Can you take on major tasks with systematic planning? ②Can you understand and solve problems from multiple perspectives?
	3. Communication competence: Ability to accurately and clearly communicate expert knowledge	①Are you capable of efficient communication for research purposes? ②Can you discuss research or research-specific knowledge with experts from your own field and from other fields?
	4. Teamwork competence: Ability to work with a team and actively contribute to the achievement of goals	①Do you have experience cooperatively and actively working on challenges as part of a team? ②Have you helped promote projects and activities other than your own research?
	5. Internationality competence: Willingness to contribute to international society	①Are you aware of making contributions to international society and getting involved in international activities? ②Have you obtained the linguistic skills necessary for international information collection and action?
	6. Materials design ability: Foundations of quantum mechanics to learn the methodologies for designing materials	①If the basic knowledge necessary for quantum mechanics research was gained ②If the methodologies for designing materials were gained

	Competences	Evaluation perspectives
Knowledge and Skills	7. Analytical ability for materials functionalities: Analytical foundations such as synchrotron radiation materials analysis, spectroscopy, scanning probe microscopy and electron microscopy to learn the techniques for analyzing materials functionalities at the molecular and electron level	①If analytical foundations such as synchrotron radiation materials analysis, spectroscopy, scanning probe microscopy and electron microscopy were gained ②If the techniques for analyzing materials functionalities at the molecular and electron level were gained
	8. Materials creation ability: Foundations and methodologies for the synthesis of novel materials and the build of high-performance devices	①If the foundations for the synthesis of novel materials and the build of high-performance devices were gained ②If the methodologies for the synthesis of novel materials and the build of high-performance devices were gained
	9. Fundamental engineering ability: Basic knowledge, academic abilities and research ethics appropriate to highly specialized professionals in the areas of engineering	①If the basic specialized knowledge in the areas of engineering sciences was gained ②If a wide range of specialized knowledge necessary for the applied development of research in the areas of engineering sciences was gained ③ If researcher ethics and engineer ethics were understood and adhered by
	10. English communication ability: Ability to use English for the active access to researchers in the world to communicate as to research	If one has interests in global research trends in the areas of engineering sciences and if the ability to communicate in English with researchers in the world was gained
Guidelines for Assessing Learning Outcomes	The final examination (Master's thesis presentation) involves an oral presentation on the research objectives, methods, results, and discussion within the Master's thesis. This presentation is evaluated on a five-point scale for knowledge application ability, management ability, communication ability, and teamwork ability. Furthermore, during the oral examination following the presentation, the candidate's ability to provide appropriate responses regarding material design ability, analytical ability for materials functionalities, material creation ability, and fundamental engineering ability is evaluated on a five-point scale. Furthermore, through presentations and oral examinations conducted in English, students' internationality competence and English communication ability are confirmed to have been acquired.	

Evaluation Criteria for Degree Theses/ Dissertations	【Review board members】 Structure of thesis review board Set up with one chief reviewer and two or more sub-reviewers. 【Review method】 The thesis review board administers thesis review and the final exam or the confirmation of academic abilities. 【Review items】 1. The setup of research tasks and the selection of research methods must be appropriate. 2. The line of reasoning must be clearly developed in English from the objectives of research to the conclusions. 3. The preceding researches related to research tasks must be grasped and understood with appropriate appraisal and citation. 4. With adherence to research ethics, the obtained results and conclusions must be verifiable by third parties. 5. Academic significance must be identifiable in research findings. 【Level standards required for the degree thesis】 All of the above evaluation items must be met. The thesis passes with the final exam or the confirmation of academic abilities included in the judgment.

Curriculum Policy

Realms as pillars of education and research: Organized in energy materials engineering, environmental materials engineering, and electronic materials engineering.
The Program is designed to provide students with education and research supervision to develop a breadth of basic skills in pure and applied sciences and to have the big picture in mind in science and technology, which extends over natural science and engineering, as well as the generic knowledge and ability that support students to be active in diverse social scenes, along with the research ability, specialized knowledge and ethics in each area of expertise.
The education programs, which are all taught in English, are organized with Foundation Subjects for Major, which seek to enrich the disciplinary foundation, and Major Subjects, which cover leading-edge academic research.

Curriculum Design Framework	In order to cultivate the basic skills and wide perspectives as well as generic knowledge and ability in associated areas with the student's major at the core, Colloquium on Pure and Applied Sciences (1 credit) must be taken as a required subject from Degree Programs' Common Courses, and students are encouraged to take other Degree Programs' Common Courses, Inter-disciplinary Foundation Courses and Graduate General Education Courses. The research supervision takes a multiple-instruction scheme to develop a research ability that exerts multifaceted perspectives.

Curriculum Design Framework	– This curriculum arrangement is set down with students' interests in mind: On the one hand, students gain the basic concepts indispensable to pursue the Doctoral Program to be active as leading researchers in the future; on the other hand, students develop practical abilities that directly connect to research and development at companies. – The seminars, including open seminars, in which students present their own research, and combined seminars, in which multiple laboratories are interrelated, help students cultivate a broad range of abilities to debate in English.
Teaching and Learning Methods	– With Materials Innovation Research IA, IB, IIA and IIB (Required subject: 3 credits each), students work on the research of their respective area of expertise and gain the basic knowledge by the end of the Master's Program. Students seek to improve the research ability to advance to the Doctoral Program and build the potential to accomplish the world's top research results in the future. – With Open Seminar IA, IB, IIA and IIB (Required subject: 1 credit each), Students present their respective research in English and make active English discussions. The resumes of presentations are created in English. Communication ability in English is gained. – With Joint Seminar IA, IB, IIA and IIB (Elective subject: 1 credit each), each student participates in research activities of other laboratories or those overseas over one semester to seek to deepen the research level in their own research theme and extend their interdisciplinary points of view. Students also experience diverse research environments by going to the seminars of other laboratories of areas different from the one that the student belongs, and are required to submit a report as to what they learn there.

Admission Policy

Desired Student Profile	We seek candidates who possess outstanding fundamental abilities and intellectual capabilities and are eager to research by actively opening up a new realm with an ambition to become an outstanding researcher in the future. The Program, which is all taught only in English, demands candidates to have sufficient English proficiency.
Student Selection Process	– Candidates are solicited all over the world, not limited to Japan. The Program seeks candidates with a variety of backgrounds regardless of differences in nationality, race and gender. The quality that the Program values more than any other is a positive attitude that the candidate had toward the basic knowledge and basic experiment in the four years of the university. The potential students to be selected out should demonstrate the abilities that will be indispensable for the world's top graduate school master's program. – Through an online interview, candidates are evaluated for their basic academic abilities, abilities to debate in English, and logic forming skills. In addition, candidates' motivation to research is judged from the aspiration they have for the Master's Program and the subsequent future.

Learning Support Framework

Academic Support	We provide support for travel expenses and registration fees for presentations at international conferences and symposia in the field of materials science. Additionally, we offer guidance on presentations (oral and poster) for such events, including practice for Q&A sessions.
Opportunities for Peer Interaction	Research exchange at the Open Seminar, and a master's thesis presentation for all participants, followed by an exchange of opinions.
Opportunities for Student–Faculty Interaction	Experience research in different fields through joint research with other laboratories, as well as a master's thesis presentation and subsequent exchange of opinions in which all students participate.

Approaches to Assuring and Enhancing Educational Quality

Students' learning outcomes are evaluated through mid-term and final assessments and master's thesis presentations, and the validity of the curriculum and the appropriateness of instruction are verified.