Doctoral Program in Life Science Innovation (Biomolecular Engineering)

■ Doctor of Philosophy in Bioengineering〕

Program Educational Objectives

Highly specialized professionals or researchers who acquire cross-sectional and bird's eye view of life science, acquire world-class advanced specialized research capabilities, use all bioresources and globally play an active role in the areas of R&D of innovative functional materials that open up new developments in life science research.

Graduate Profile	Researchers and highly specialized professionals who can create highly international competent research outcomes such as functional materials that use biomolecules by utilizing a broad knowledge relating to biomolecules and their application development and distinguished ability to set/solve issues.

Diploma Policy

The degree of Doctor of Philosophy in Bioengineering is commenced to those who have fulfilled the requirements for the completion of the Doctoral 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 creation competence: Ability to create new knowledge that can contribute to future society	①Are there any research findings that can be considered new knowledge? ②Can we expect you to create knowledge that will contribute to future society?
	2. Management competence: Ability to plan and implement measures to identify and solve challenges from a higher perspective	①Can you make and implement long-term plans for critical challenges? ②Can you identify challenges, even in other areas of expertise, and solve them from a higher perspective?
	3. Communication competence: Ability to express the true nature of academic findings positively and clearly	①Can you explain the true nature of research content and specialized knowledge clearly and logically to researchers from different areas and to people other than researchers? ②Do you proactively share your findings with researchers and experts from your field of expertise and accurately answer questions?
	4. Leadership competence: Ability to have objectives get accomplished under your leadership	①Can you set attractive and compelling goals? ②Are you capable of building systems to realize goals and accomplish objectives as the leader?
	5. Internationality competence: Possession of a high level of awareness and motivation to be internationally active and contribute to international society	①Do you have strong awareness and motivation to contribute to international society and international activities? ②Have you obtained adequate linguistic skills for international information collection and action?

	Competences	Evaluation perspectives
Knowledge and Skills	6. Innovation ability: Ability to make innovations in the areas of life science.	①If there is the awareness and motivation to create new knowledge and pass it along to the society in the areas of life science ②If the research techniques and reasoning skills for the theory and practice that lead to innovation creation in the areas of life science were gained ③If issues that have not been revealed in bioengineering were identified and solved ④If there is the motivation to identify and solve cross-disciplinary research tasks in cooperation with researchers from different areas and not just one's own area
	7. Specialized knowledge: Leading-edge knowledge in the area of expertise	①If leading-edge specialized knowledge about bioengineering was gained ②If a research plan for solving unsolved issues was drawn up based on gained specialized knowledge
	8. Advanced practical English: Command of English sufficient for performing various activities involving research in the international society	①If the presentation ability that can impact the international society when research outcomes are reported or shared in English was gained ②If the English proficiency and knowledge to debate equally with researchers active in the front lines were gained
Guidelines for Assessing Learning Outcomes	The knowledge and competences outlined in the Diploma Policy are assessed using the following direct evaluation methods. – Based on a curriculum designed to achieve the competences defined by the Doctoral Program in Life Science Innovation, student outcomes—including work from required subjects—are evaluated continually by course instructors, supervisory faculty members, and thesis committee members from enrollment to completion. – At the end of the first year, Achievement Evaluation I is conducted, and one year before the expected completion, Achievement Evaluation II and the Midterm Review are held. Through document review and an oral examination, these evaluations are administered to determine whether the student has attained the required level of the competences specified in the Diploma Policy. – Five months prior to the expected completion, Achievement Evaluation III and the Preliminary Thesis Review are conducted. Through document review and an oral examination, these evaluations are administered to verify that the student has fully achieved the competences specified in the Diploma Policy, and to determine their eligibility to take the Final Examination.	

Guidelines for Assessing Learning Outcomes	– The Final Examination is conducted, in which the thesis is evaluated through a review and an oral examination. Through this process, a final assessment is made to confirm that the student has fully achieved the competences specified in the Diploma Policy at the required level.
Evaluation Criteria for Degree Theses/ Dissertations	【Level standards required for the degree thesis】 The degree dissertation must be the results of work in which the diploma applicant took the initiative and must contain research findings that are unprecedented and internationally highly appraised and that contribute to make strides in the areas of Biomolecular materials field. The degree dissertation must be written in English logically and scientifically and must be constructed in an appropriate format as a degree dissertation. 【Review board members】 A dissertation is reviewed by an exclusive board formed by one chief reviewer and three or more sub-reviewers. The chief reviewer must be a faculty member assigned to supervise the research in the Program. As the three or more sub-reviewers, two or more faculty members qualified to supervise the research in the Program must be included. The four or more reviewers of the exclusive board must include one or more reviewers from each of the both internal and external Program faculty members, and this is how diploma examination is administered in a system cooperative between internal and external faculty members. In addition, as the four or more reviewers of the exclusive board, no more than one reviewer who does not belong to the Program can be included. 【Review method and review items, etc.】 The applicant is asked to explain his or her degree thesis content and then questioned by exclusive board members about what he or she has explained. The presentation of dissertation content and a question-and-answer session, which are part of the final exam, are publicly administered. During this examination, in which the applicant is required to make a presentation about his or her degree dissertation in English logically and scientifically, the applicant is evaluated to see if he or she can convince the reviewers sufficiently by answering the reviewers' questions with insight and by using the advanced specialized knowledge of the areas of Biomolecular materials field and including the latest research trends.

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Curriculum Policy

Students are engaged in the research activities for identifying and solving unsolved issues for making innovations in the realms of Biomolecular materials area. The curriculum includes internship subjects to support students in making innovations, for which they need to have the high awareness and motivation to work on research tasks in very different and/or cross-disciplinary areas in cooperation with researchers in different areas not just one's own area of expertise. In addition, to gain the cross-disciplinary way of thinking with the big picture in mind and cultivate the world's top-class advanced specialized research ability, the curriculum also organizes seminars taught by researchers who are active in the front lines and belong to overseas research institutes.

Curriculum Design Framework	– Curriculum of biomolecular engineering area shall be composed of Major Subjects, basic courses common to six program areas of this Degree Program (Disease mechanism, Drug Discovery, Food Innovation, Environmental Management, Bioinformatics and Biomolecular Engineering) and Graduate General Education Courses. In Major Subjects, students are supervised for Biomolecular materials research.
Curriculum Design Framework	– Competence of knowledge creation is gained through doctoral dissertation creation, etc. – Management competence is gained through “Doctoral Competence Development”, etc. – Communication competence is gained with “Practices in Life Science Innovation”, etc. – Leadership competence is gained through “Doctoral Research in Life Science Innovation”. – Competence in Internationality is gained through “Doctor's Life Science Innovation Seminar”, etc. – Innovation ability is gained through General Foundation Subjects, Major Subjects, etc. – Specialized knowledge is gained through “Doctoral Research in Life Science Innovation”, etc. – Advanced practical English is gained through “Doctor's Life Science Innovation Seminar”, etc.
Teaching and Learning Methods	– With the understanding of the latest research trends in Biomolecular materials, students identify issues that have not been revealed and draw up and carry out an appropriate research plan for solving them. Further, through critical debates with supervisory faculty members, students develop the plan into a research that leads to produce life science innovations. – Obtained research findings are presented in academic journals, etc. With this, students improve their English proficiency, and in the process, gain reasoning skills. – With General Foundation Subjects and Graduate General Education Courses, students learn the latest research trends in the areas of life science and also improve English presentation ability. – Through internships, you will hone your research skills through the experience of collaborating with researchers outside the field to create new knowledge.

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Admission Policy

Desired Student Profile	We seek candidates who have the sufficient qualities to gain the basic research abilities that are expected to make innovations in the areas of Biomolecular materials area, the specialized knowledge necessary to achieve it, and good command of English serving for various research activities in the international society.
Student Selection Process	– Candidates are selected through document screening to evaluate if they possess master's degree level specialized knowledge (excellence in the current academic performance), and the ability to explain concretely in English about research backgrounds, research plans and about passing along research findings to the society. – Through an English proficiency test and an oral examination, candidates are evaluated on their motivation and fundamental research skills to drive innovation in the field of Biomolecular Engineering, as well as their English proficiency (equivalent to CEFR level B2 or higher), which is necessary for conducting research activities in the Doctoral Program in Life Science Innovation.

Learning Support Framework

Academic Support	In the Doctor's Life Science Innovation Seminar, key research skills—such as presentations, grant writing, and CV preparation—are covered by international faculty, including those from the University of Oxford. Laboratory performance is assessed through supervisory interviews, with feedback provided based on records of daily research activities.
Opportunities for Peer Interaction	Research presentations and journal clubs are conducted online in small groups throughout the year,providing opportunities for active discussions even among students from different disciplines.
Opportunities for Student–Faculty Interaction	Sessions are organizedat the Tsukuba Conference (odd-numbered years) and Tsukuba Global Science Week (even-numbered years) to facilitate broad interaction between students and faculty. When international faculty conduct in-person seminars, networking events with students are organized in conjunction.

Approaches to Assuring and Enhancing Educational Quality

Every year, the three policies of the degree program are explained to faculty members, along with the principles of credit acquisition, grading criteria and policies, and the degree completion process. Additionally, course evaluation results are shared, and faculty members provide feedback based on their reflections on teaching and the student survey results. For achievement evaluations, a review session is held exclusively among evaluators to discuss the assessment results and exchange opinions aimed at improving educational quality. In addition, the Degree Programs Steering Committee regularly evaluates students' learning outcomes by tracking Achievement Evaluation scores, and evaluates the validity of the curriculum and evaluation criteria, as well as the appropriateness of academic guidance.