Master's Program in Physics

Name of the degree to be conferred	Master of Science
Educational purpose	The Master's Program in Physics cultivates human resources who have the specialized knowledge and a wide perspective in physics, which is the foundation of natural science, as well as the fundamental abilities to perform research in areas associated with physics and also possess the flexible ability to apply their expertise to assume a role in highly specialized professions.
Vision of human resources development	He or she should possess not only the qualities in physics but also the knowledge about the areas of associated disciplines and also the ability to scientifically challenge and break through problems that should be elucidated and solved and thereby can independently drive forward research in the Doctoral Program. In the course of the history of the universe, the Program adopts a system of education that crosses over international research bases based on the viewpoint of seeing the disciplinary areas of particle physics, nuclear physics and physical cosmology as the evolution processes of the universe. We thereby seek human resources who possess the interdisciplinary ability to involve all these areas along with a high level of expertise and are capable of being internationally active concerning the history of the universe. In the course of accelerator science, he or she should be capable of being active in this field in the future, through the research and next-generation accelerator development using the B-factory, J-PARC and accelerator-based synchrotron radiation science research facility of High Energy Accelerator Research Organization, etc. In the course of synchrotron radiation materials science, he or she should gain knowledge and skill in both areas of synchrotron radiation, etc. in addition to materials science through the research utilizing synchrotron radiation facilities (for example, PF, J-PARC, SPring-8 and overseas facilities), etc. and be capable of promoting materials development at synchrotron radiation facilities or private sector companies.
Competencies specified in diploma policy	Evaluation perspectives
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. Application ability: Fundamental abilities to put physical knowledge into use for human society development by identifying a universal structure in the natural setting	①If the relationship between physics and society is considered on the basis of wide knowledge in the areas of physics ②If one can imagine an example of using the knowledge in their own area of expertise to contribute to the society
7. Physical ability: Leading-edge scholarly knowledge and the ability to debate and conduct joint research with researchers inside and outside Japan	①If the basic specialized knowledge in the areas of physics was gained and physical phenomena are addressed with logical thinking ②If the specialized knowledge in one's own area of research was gained and research is thereby driven forward

8. Information provision ability: Ability to provide a clear description of one's research to those from different areas and not just one's own area	①If the academic importance of one's own research is explained ②If a description of concepts peculiar to physics is made clear to those from different areas and not just one's own area
9. Logical ability: Dedication to duty and logicality as a scientist	①If one is enthusiastic about searching for natural truth ②If one's commitment to research is scientific and sincere

Dissertation evaluation criteria

【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 final exam. The final exam includes the evaluation of the ability for presenting one's research content to those from different areas and not just one's own area.

【Review items】

1. Grasping and understanding of preceding researches associated with one's research content, and the appropriate appraisal and citation of their literature and materials
2. Clear presentation of the backgrounds, purposes and methods of the research
3. Reproducibility of obtained results, or verifiability by third parties
4. Unequivocal thesis construction, and appropriate development of line of reasoning before reaching the conclusion

【Level standards required for the degree thesis】

With the adherence to research ethics, all of the above evaluation items must be met. The thesis passes as a master's thesis with the above requirements and the final exam included in the judgment.

Curriculum Policy

The Program consists of a total of ten areas of expertise, which are theoretical particle physics, experimental particle physics, cosmology, observational cosmology, theoretical nuclear physics, experimental nuclear physics, theoretical condensed matter physics, experimental condensed matter physics, biophysics, and plasma physics, and a total of three realms, which are the history of the universe, accelerator science, and synchrotron radiation materials science.

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.

Curriculum organization policy	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. ・Students belong to their respective area of specialty and thereby gain a high level of expertise. ・In the areas of particle physics, nuclear physics and astrophysics, the course of the history of the universe is organized for a system of education crossing over international research bases. In the areas of condensed matter physics, the Program organizes the course of synchrotron radiation materials science, where students can acquire the knowledge and skill in synchrotron radiation application which serves as a powerful technique for the search in materials science, through the cooperation of Japan Synchrotron Radiation Research Institute and Photon Factory. In addition, the course of accelerator science is organized through the education and research tie-up with High Energy Accelerator Research Organization. ・Since physics is the foundation of natural science, the Program in Physics is deeply interrelated in research and education with other Programs of Graduate School, and research centers (Center for Computational Science, Tomonaga Center for the History of the Universe, Tsukuba Research Center for Energy Materials Science, Plasma Research Center, etc.) as well as major research institutes inside and outside Japan. Taking advantage of this characteristic, the Program provides various education programs, including the Cooperative Graduate School System (National Institutes for Quantum and Radiological Science and Technology, National Institute of Advanced Industrial Science and Technology, National Institute for Materials Science, RIKEN, NTT, NEC, etc.) and Tsukuba Resonance Education Program.

	・By taking special research subjects of each area, students acquire a wide perspective, and through the deepening of each one's original research theme, develop fundamental and applied abilities and fortitude as a researcher. ・Students acquire practical abilities with information provision/communication ability development subjects in Graduate General Education Courses.
Learning methods・Processes	・Students widely learn the foundation of physics with Foundation Subjects for Major and gain advanced specialized knowledge in each area with Major Subjects. ・"Physics Seminar", in which students learn the latest topics of particularly extensive modern physics, is placed as a required subject. ・Taking seminar and special research subjects of each area, students learn in the leading-edge research setting of their respective area of specialty under the close supervision of faculty members to deepen the scholarly knowledge of the area and carry out their research for a degree thesis. ・In addition to the subjects of specialty, students take Graduate General Education Courses and Degree Programs' Common Courses to acquire communication ability, etc.
Evaluation of learning outcomes	・Foundation Subjects for Major / Major Subjects: Whether knowledge necessary for carrying out research was gained is evaluated with exams, reports, etc. ・Special research and seminar: In special research and seminar subjects, etc., students are evaluated for the achievements as to specialized knowledge, foundations in associated areas, wide perspective, presentation and communication abilities, international compatibility, academic outcomes and all other evaluation items through the experience of attending a special interest group, academic conference, international conference, etc. in addition to routine activities such as seminars, debates and literature introduction. ・Review of degree thesis: In the thesis presentation and oral exam at the review of degree thesis, students are evaluated for the achievements as to presentation and communication abilities, international compatibility, academic outcomes and other evaluation items.
Admission Policy	
Desired students	We seek candidates who have bachelor's degree level skills in physics and its associated scientific areas and English proficiency, have the great interest and motivation to conduct leading-edge research in the areas of physics and pursue to be a researcher in academia and industry.
Selection policy	・Candidates are selected through written and oral exams. ・In the general entrance exam, candidates must have physical comprehension and basic mathematical comprehension as equivalent to a university graduate and English proficiency necessary for carrying out physical research. ・The recommendation entrance exam places emphasis on the activities that the candidate has been engaged so far in the areas of physics and also the aspiration and research plan that the candidate wishes to achieve after admitted.