DEPARTMENT OF ACCELERATOR SCIENCE

Academic Goals

On global demand for accelerator specialists, the department of accelerator science provides an advanced program especially in professional and systematic manner. It is based on fundamental principles of physics to extent to the design, management, and application of accelerators. We focus on participating with global network of accelerator groups, which would provide various opportunities in fundamental scientific research and application developments.

Fields of Study

Accelerator Science

Degree Requirements

1. Students for Master degree are required to complete 12 credits, including Classical Electromagnetism I, Quantum Mechanics I, Accelerator Physics I, and Beam Dynamics I.
2. Students for Ph.D degree are required to complete 12 credit hours of Classical Electromagnetism I, Quantum Mechanics II, Accelerator Physics II, and one among Accelerator Experiment I, II, Detector Experiment I, II, which was not completed in the Master's program, in addition to the requirements of 12 credits for the Master's program.
3. For the Master/Doctoral combined program, students must complete the same credits required for the Ph. D program students.
4. Classical Mechanics I, II, Classical Electromagnetism I, II, and Quantum Mechanics I, II, passed in other departments will be accepted as our credit(s), and other courses could be recognized as our major courses under the approval of the department academic committee.
5. Advisor can designate undergraduate courses, including Classical Mechanics, Electromagnetism, Modern Physics, Mathematical Physics, Special Relativity.

Comprehensive Examinations

1. The Comprehensive Examinations for the Master's degree consist of Classical Electromagnetism I, Quantum Mechanics I, and Beam Dynamics I.

2. The Comprehensive Examinations for the Ph.D. degree consist of two parts; core courses (Electromagnetism II, Quantum Mechanics II and Accelerator Physics I, II) and the major field.
3. The Comprehensive Examinations will be taken by written test and/or by oral.The chance for the oral test is limited by the department rules below, and it is managed by more than two committee members.
4. Pass/fail of each course is judged by the department committee.
5. The Comprehensive Examinations for the Master degree can be replaced by one SCI paper, if the candidate is the principal author(first and corresponding) of the paper.
6. The Comprehensive Examinations for the Ph.D degree can be replaced by three SCI papers, if the candidate is the principal author(first and corresponding) of the papers.
7. The Comprehensive Examinations for the Master/Doctoral combined program are the same as those for the Ph.D. program.
8. Chance of taking examinations is limited by three for the Master degree.

▌Courses and Syllabuses▐

ACS 501 Classical Mechanics [3]

Particle dynamics, Variational method and Lagrange equation, Two-body problem and collision, Rotational and Vibrational motions

ACS 502 Classical Mechanics II [3]

Hamilton equation of motion, Canonical Transformation, Perturbation

ACS 503 Classical Electromagnetism I [3]

Electrostatics, Boundary problem, Multipole, Magnetostatics, Maxwell equations

ACS 504 Classical Electromagnetism II [3]

Electromagnetic wave, Wave guide and Cavity, Scattering and refraction, Plasma, Radiation

ACS 505 Quantum Mechanics I [3]

Schroedinger equation, Central force field and angular momentum, Perturbation theory, Spin

ACS 506 Quantum Mechanics II [3]

Second quantization, Symmetry, Addition of angular momentum, Magnetic field and charged particle, Structure of nucleus, Scattering

ACS 511 Accelerator Experiment I [3]

Basic experiment for development of accelerator

ACS 512 Accelerator Experiment II [3]

Advanced experiment for development of accelerator

ACS 513 Detctor Experiment I [3]

Basic experiment for development of detector

ACS 514 Detctor Experiment II [3]

Advanced experiment for development of detector

ACS 551 Special Relativity Theory [3]

Light, Lorentz transformation, Relativity dynamics, Relativity and electromagnetism

ACS 561 Nuclear Physics [3]

Property of nucleus, Neuclear force and decay, Structure of nucleus, Nuclear reaction

ACS 562 Elementary Particle Physics [3]

Classification of elementary particles and symmetry, Interaction, Experiment and theory of standard model

ACS 563 Physics with Light Source [3]

Surface analysis, Generation of radiation, Radiation application

ACS 601 Accelerator Physics I [3]

History of accelerator, Fundamentals of particle accelerator, Classification and property of accelerators, Application of accelerator, Basic beam physics

ACS 602 Accelerator Physics II [3]

High frequency acceleration of charged particles, Electromagnetic analysis of beam, Beam dynamics

ACS 603 (Beam Dynamics I) [3]

Linear beam optics, Beam instability, Linear accelerator design

ACS 604 Beam Dynamics II [3]

Non-linear beam optics, Circular accelerator design, Collider design

ACS 621 High Vacuum Technology [3]

Gaseous molecular dynamics, Gas-surface interaction, Materials for vacuum devices, Vacuum measurement

ACS 622 RF System [3]

Accelerator cavity, Properties of high frequency wave, Generation and control of RF system, Wave guide, Design of high-power RF devices

ACS 623 Cryogenic Techniques [3]

Helium liquidization, Principle and design of cryogenics, Design for low temperature devices, Application of superconducting devices

ACS 624 Magnets [3]

Dipole/quadrapole solenoid design, Low/high temperature superconducting magnets, Power supplying devices for magnet, Measurement of magnetic field

ACS 625 Ion Sources [3]

Fundamental plasma physics, Electron beam generation devices, Proton and heavy ion beam generating systems

ACS 626 Beam Diagnosis and Control [3]

Beam measuring method and apparatus, Designing accelerator control system, Timing system, Control software

ACS 627 Radiation Physics [3]

Response of radiative material, Radiation and bio system, Radiation shield and safety

ACS 628 Lasers and Atomic Physic [3]

Properties of atomic structure, Coherence of atomic system, Principle and application of Laser

ACS 651 Radiation Detectors [3]

Response of particles in materials, Principles and application of various detectors, Detector signal procession

ACS 652 Semiconductor Detectors [3]

Principle and application of various semiconductor detectors, Design and application of semiconductor detectors

ACS 661 Computational Physics [3]

Concept of computing, Numerical analysis, Monte-Carlo method, Various application packages

ACS 662 Data Analysis [3]

Date analyzing method, Statistics and probability, Statistical error and experimental error

ACS 701 Special Topics on Accelerator Physics I [3]

Recent research topics on accelerator physics

ACS 702 Special Topics on Accelerator Physics II [3]

Recent research topics on accelerator physics

ACS 703 Special Topics on Accelerator Application I [3]

Recent research topics on accelerator application

ACS 704 Special Topics on Accelerator Application II [3]

Recent research topics on accelerator application physics

ACS 801, 802 (Research in Accelerator Science I, II) [3]

Recent research topics on accelerator and thesis preparaton

ACS 803, 804 (Research in Accelerator Application I, II) [3]

Recent research topics on accelerator application and thesis preparation