

Common Specialized subjects of the School of High Energy Accelerator Science

Subject Code	Subject	Credit	Content of subject	
10SHA001	High Energy Accelerator Seminar I	2	Active fields of accelerator related science, such as elementary particles, nuclear physics, materials science and life science etc., will be presented by front-line researchers.	
10SHA002	High Energy Accelerator Seminar II	2	Active fields of accelerator related science, such as elementary particles, nuclear physics, materials science and life science etc., will be presented by front-line researchers.	
10SHA003	High Energy Accelerator Seminar III	1	Active fields of accelerator related science, such as elementary particles, nuclear physics, materials science and life science etc., will be presented by front-line researchers.	
10SHA004	High Energy Accelerator Seminar IV	1	Active fields of accelerator related science, such as elementary particles, nuclear physics, materials science and life science etc., will be presented by front-line researchers.	
10SHA007	High Energy Accelerator Seminar VII	2	Active fields of accelerator related science, such as elementary particles, nuclear physics, materials science and life science etc., will be presented by front-line researchers.	
10SHA008	High Energy Accelerator Seminar VIII	2	Active fields of accelerator related science, such as elementary particles, nuclear physics, materials science and life science etc., will be presented by front-line researchers.	
10SHA009	Introduction to Accelerators I	2	General introduction to accelerators in omnibus-style classes for specific fields by the experts and given in Japanese.	
10SHA010	Introduction to Accelerators II	2	General introduction to accelerators in omnibus-style classes for specific fields by the experts and given in English.	
10SHA027	Seminar on Introduction to Accelerators I	2	General introduction to accelerators in omnibus-style seminars and practicals for specific fields by the experts and given in Japanese.	
10SHA028	Seminar on Introduction to Accelerators II	2	General introduction to accelerators in omnibus-style seminars and practicals for specific fields by the experts and given in English.	
10SHA011	Introduction to Experimental Methods Using Accelerators	2	Introductory lectures on basic phenomena and methods necessary in experiments of particle, nuclear, synchrotron light using accelerators. They will involve special relativity, scattering, cross section, bremsstrahlung, synchrotron radiation, vacuum, electric discharge, diffraction, etc.	YOSHIDA, Mitsuhiro
10SHA012	Radiation Physics	2	This class is on the basic topics about generation of radiation ray and interaction of radiation and matter. 1. Structure of atom and ionization 2. Structure of nucleus 3. Decay of radioactive nucleus 4. Nuclear interaction 5. Interaction of x ray and gamma ray 6. Interaction of beta ray 7. Interaction of proton ray and alpha ray 8. Interaction of neutron 9. Transfer of energy to material 10. Quantity and unit of radiation ray.	NAMITO, Yoshihito HAGIWARA, Masayuki
10SHA013	Beam Physics I	2	Principles of accelerators, generation of synchrotron light, collective motion of beams, and coherent synchrotron radiation etc. are presented from the unified viewpoint of beam physics. Single particle dynamics is treated mainly by course I, and collective motion and coherent effects are treated mainly by course II.	NAKAMURA, Norio FUNAKOSHI, Yoshihiro
10SHA014	Beam Physics II	2		OHMI, Kazuhito
10SHA015	Applied Mathematics	2	Main theme of the course is the complex analysis of one variable. In addition, related other branches will be also lectured. Through the course, mathematical image (intuition) and technique of students will be refined and advanced.	MORITA, Akio NISHIKAWA, Patrice

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10SHA016	Electromagnetism	2	Lectures on basics of electromagnetism necessary to understand accelerators will be given. Contents: Vector Analysis /Static electromagnetic field /Maxwell equations /Transmission of electromagnetic field /Waveguides and resonant cavities/Radiation from charged particles /Interaction between charged particles and material (electromagnetic field).	KURIMOTO, Yoshinori
10SHA017	Electrodynamics and Special Relativity	2	This course will cover the special theory of relativity and the theory on relativistic motion of particles which is a basis of particle motion in accelerators.	YAMAMOTO, Noboru
10SHA018	Analytical Dynamics	2	This course introduces practical techniques for the simulation and understanding of dynamical systems with special emphasis on accelerators.	NISHIKAWA, Patrice
10SHA019	Quantum Mechanics	2	Introduced will be important concepts to understand elementary quantum mechanics, such as the Bohr model of atom/ the Sommerfeld-Wilson quantization condition/ Schrödinger equation/ commutation relation of operators and uncertainty principle/ state transition probability/ path integral and classical limit. Similarity and difference to classical mechanics will be highlighted.	MORITA, Akio NISHIKAWA, Patrice
10SHA020	Thermodynamics/Statistical Mechanics	2	The lecture starts from the explanation of basic materials such as the entropy, thermodynamic laws, partition function, etc. As an application, selected topics related to accelerator, such as surface phenomena, refrigerator, etc will be discussed.	NAKANISHI, Kota
10SHA021	Modern physical chemistry	2	Fundamental concepts of physical chemistry will be presented. Also, basic experimental methodologies for understanding non-equilibrium system, catalysis and surface chemistry will be discussed.	ONO, Kanta
10SHA022	Introduction to the Condensed Matter Physics	2	Fundamental concepts for the understanding of condensed matter are presented with an introduction to the microscopic probes including synchrotron radiation, neutron and muon as tools for the study of electronic property.	KADONO, Ryosuke
10SHA023	Introduction to Biology	2	Basic concepts of modern biology including biochemistry, molecular biology and cell biology with particular attention to structural biology.	SENDA, Toshiya
10SHA025	Modern Quantum Mechanics	2	Starting from the basic structure of quantum mechanics and quantization, we present various fundamental issues of quantum mechanics, such as the interpretation of wave function, quantum measurement, uncertainty relation, EPR paradox and Bell's inequality, contextuality, entanglement, and weak value/weak measurement.	TSUTSUI, Izumi
10SHA026	Measurement and control technology for experimental physics	2	The basics and applications of measurement and control technologies in physics experiments are presented by researchers in both schools of accelerator and physical sciences. The course makes clear the similarity and difference of experimental technologies in both science field, and introduces ideas for interdisciplinary collaboration.	UCHIDA, Tomohisa
90SHA001	Qualifying Research in High Energy Accelerator Science	4	Students are required to perform a research on an advanced subject in accelerator science.	adviser
10SHA029	Basis and application of synchrotron radiation	1	This course provides an overview of basis and application of synchrotron radiation, such as synchrotron light source, beamline technology, X-ray absorption spectroscopy (XAS), X-ray absorption fine structure (XAFS), magnetic circular dichroism (MCD), X-ray photoelectron spectroscopy (XPS), angle-resolved photoemission spectroscopy (ARPES), X-ray imaging, and scanning transmission X-ray microscope/microscopy (STXM).	HIRANO, Keiichi MASE, Kazuhiko AMEMIYA, Kenta HORIBA, Koji ONO, Kanta
10SHA030	Particle accelerator and detector	1	The lecture gives an introductory course of particle accelerators and detectors which will be essential in various field of fundamental science like experimental particle and nuclear physics, photon science or neutron science using quantum beam.	HABA, Junji OHMI, Kazuhito
10SHA031	Soft Condensed Matter Physics	2	Properties of soft condensed matters such as polymers, liquid crystals, colloids, and amphiphilic molecules will be explained from the viewpoint of physics.	SETO, Hideki

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10SHA032	Introduction to Symmetry and Space group	2	The training course aims at providing a solid background in symmetry and group theory using various materials structures. Participants are requested to actively take part in solving the proposed exercises.	NESPOLO, Massimo
10SHA033	Basic of signal processing for sensors	1	A lab-intensive introduction to basics of sensors and their analog signal processing design skills through design exercises, discussion using Computer Aided Design(CAD) tools for detection system development(e.g. imaging sensor system etc)	TANAKA, Manobu

 : Compulsory Subject