

Special Subjects of the Department of Particle and Nuclear Physics

Field	Subject Code	Subject	Credit	Content of subject.	
Fundamental Theories of Particle Physics	20DPNa01	Introduction to Field Theory I	2	Basic concepts in field theory which are indispensable for studying particle and nuclear physics.	ENDO, Motoi
	20DPNa02	Introduction to Field Theory II	2		HASHIMOTO, Shoji
	20DPNa03	Superstring Theory I	2	Basics of the worldsheet theory of (super)strings leading to the miraculous consistency and the uniqueness of superstrings. Introduction to the applications to particle physics and cosmology.	
	20DPNa04	Superstring Theory II	2	Basics of the modern technology to deal with the nonperturbative effects in string theory (string/string duality, algebro-geometric methods, etc.) in view of applications to particle physics and cosmology.	
	20DPNa05	Superstring Theory III	2	Basics of the worldsheet theory of (super)strings leading to the miraculous consistency and the uniqueness of superstrings. Introduction to the applications to particle physics and cosmology.	MIZOGUCHI, Shunya
	20DPNa06	Superstring Theory IV	2	Nonperturbative effects in superstring theory and approaches aiming at constructing nonperturbative formulations.	NATSUUME, Makoto
	20DPNa11	Advanced Field Theory I	1	Numerical methods which enable nonperturbative studies of field theory.	ISO, Satoshi
	20DPNa08	Advanced Field Theory II	2	Approaches to investigate non-perturbative aspects of (quantum) field theories including the topological classification of field configurations.	
	20DPNa09	Seminar on Field Theory I	2	Seminars to learn basic knowledge and skills of quantum field theories required in theoretical investigations of particle and nuclear physics through exercises and reading important literature.	KANEKO, Takashi
	20DPNa10	Seminar on Field Theory II	2		YAMADA, Norikazu
Particle Physics Phenomenology	20DPNb01	Theoretical Particle Physics I	2	Lectures on the Standard Model of elementary particle physics based on experimental results.	NOJIRI, Mihoko
	20DPNb02	Theoretical Particle Physics II	2		KITANO, Ryuichiro
	20DPNb03	Particle Phenomenology I	2	Conceptual and technical aspects of particle physics to compare experimental results with theoretical predictions.	
	20DPNb04	Particle Phenomenology II	2	Survey of unsolved problems in the Standard Model and attempts beyond the Standard Model such as Supersymmetry.	
	20DPNb05	Particle Phenomenology III	1	Most recent experimental results in high energy physics and their relation to the Standard Model and beyond.	NOJIRI, Mihoko
Lattice Gauge Theory	20DPNc03	Lattice Field Theory I	1	Non-perturbative framework for quantum field theory on a discretized spacetime (the lattice spacetime) with special attention to quantum chromodynamics (QCD).	HASHIMOTO, Shoji
	20DPNc04	Lattice Field Theory II	1	Numerical and other approaches toward solving lattice field theories, especially lattice QCD.	OHTA, Shigemi
Hadron and Nuclear Theory	20DPNd01	Introduction to Hadron and Nuclear Physics Theory I	2	Introduction to theories of hadron and nuclear structures and interactions.	KUMANO, Shunzo
	20DPNd02	Introduction to Hadron and Nuclear Physics Theory II	2		
	20DPNd04	Theoretical Hadron Physics	1	Hadron physics theories based on QCD.	ITAKURA, Kazunori MORIMATSU, Osamu
Theoretical Cosmophysics	20DPNe01	Cosmophysics I	2	Lectures on the structures and matter contents of the Universe and their origin from the standpoint of the evolutionary cosmology.	MATSUBARA, Takahiko
	20DPNe02	Cosmophysics II	2	Lectures on the stellar structure and evolution as fundamental elements of the richly layered universe, including the relevant high energy astrophysics and astro-particle physics.	
	20DPNe03	Seminar on Theoretical Cosmophysics I	2	Seminars to learn basic knowledge and skills required in theoretical investigations of cosmophysics through exercises and reading important literature.	KOHRI, Kazunori
	20DPNe04	Seminar on Theoretical Cosmophysics II	2	Seminars to learn basic knowledge and skills required in theoretical investigations of cosmophysics through exercises and reading important literature.	KYUTOKU, Koutarou
	20DPNe06	General Relativity	1	Lectures on various topics of general relativity such as singularity theorem, uniqueness of the black holes, higher dimensional black holes, gauge invariant perturbations.	
	Common Subjects for Experimental Particle and Nuclear Physics	20DPNf01	Introduction to Elementary Particle Physics	2	Introductory lecture on Elementary Particle Physics focusing on Experimental Aspects.
20DPNf02		Introduction to Nuclear Physics	2	Introductory lecture on Nuclear Physics focusing on Experimental Aspects.	OZAWA, Kyoichiro

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B Factory	20DPNg01	B Factory I	2	Advanced lecture on B Factory.	ITO, Ryosuke
	20DPNg02	B Factory II	2		
	20DPNg03	Exercise for B Factory I a	2	Advanced exercise for B Factory.	Faculty member (experimental research field) of the department of Particle and Nuclear
	20DPNg04	Exercise for B Factory I b	2		
	20DPNg05	Exercise for B Factory II a	2		
	20DPNg06	Exercise for B Factory II b	2		
Hadron Collider Energy Frontier	20DPNh01	Hadron Collider Energy Frontier I	2	Advanced lecture on Hadron Collider Energy Frontier.	
	20DPNh02	Hadron Collider Energy Frontier II	2		
	20DPNh03	Exercise for Hadron Collider Energy Frontier I a	2	Advanced exercise for Hadron Collider Energy Frontier.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNh04	Exercise for Hadron Collider Energy Frontier I b	2		
	20DPNh05	Exercise for Hadron Collider Energy Frontier II a	2		
	20DPNh06	Exercise for Hadron Collider Energy Frontier II b	2		
Lepton Collider Energy Frontier	20DPNi01	Lepton Collider Energy Frontier I	2	Advanced lecture on Lepton Collider Energy Frontier.	FUJII, Keisuke
	20DPNi02	Lepton Collider Energy Frontier II	2		
	20DPNi03	Exercise for Lepton Collider Energy Frontier I a	2	Advanced exercise for Lepton Collider Energy Frontier.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNi04	Exercise for Lepton Collider Energy Frontier I b	2		
	20DPNi05	Exercise for Lepton Collider Energy Frontier II a	2		
	20DPNi06	Exercise for Lepton Collider Energy Frontier II b	2		
Neutrino Physics	20DPNj01	Neutrino Physics I	2	Advanced lecture on Neutrino Physics. Elementary particle physics preparation at least at the level of "Introduction to Elementary Particle Physics" 20DPNf01 taken is required	FUJII, Yoshiaki SAKASHITA, Ken NAKADAIRA, Takeshi
	20DPNj02	Neutrino Physics II	2		
	20DPNj03	Exercise for Neutrino Physics I a	2	Advanced exercise for Neutrino Physics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNj04	Exercise for Neutrino Physics I b	2		
	20DPNj05	Exercise for Neutrino Physics II a	2		
	20DPNj06	Exercise for Neutrino Physics II b	2		
Kaon Rare Decay	20DPNk01	Kaon Rare Decay I	2	Advanced lecture on Kaon Rare Decay.	KOMATSUBARA, Takeshi NOMURA, Tadashi LIM Gei Youb WATANABE, Hiroaki
	20DPNk02	Kaon Rare Decay II	2		
	20DPNk03	Exercise for Kaon Rare Decay I a	2	Advanced exercise for Kaon Rare Decay.	Faculty member (experimental research field) of the department of Particle and Nuclear
	20DPNk04	Exercise for Kaon Rare Decay I b	2		
	20DPNk05	Exercise for Kaon Rare Decay II a	2		
	20DPNk06	Exercise for Kaon Rare Decay II b	2		
Muon Rare Process	20DPNi01	Muon Rare Process I	2	Advanced lecture on Muon Rare decay experiment.	MIHARA, Satoshi
	20DPNi02	Muon Rare Process II	2	Lectures on fundamental properties of muon as an elementary particle and their precision measurements.	
	20DPNi03	Exercise for Muon Rare Process I a	2	Advanced exercise for Muon Rare Process.	Faculty member (experimental research field) of the department of Particle and Nuclear
	20DPNi04	Exercise for Muon Rare Process I b	2		
	20DPNi05	Exercise for Muon Rare Process II a	2		
	20DPNi06	Exercise for Muon Rare Process II b	2		

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Muon Precision Measurement	20DPNm01	Muon Precision Measurement I	2	Advanced lecture on Muon Precision Measurement. Lectures on fundamental properties of muon as an elementary particle and their precision measurements.	MIBE, Tsutomu
	20DPNm02	Muon Precision Measurement II	2		
	20DPNm03	Exercise for Muon Precision Measurement I a	2	Advanced exercise for Muon Precision Measurement.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNm04	Exercise for Muon Precision Measurement I b	2		
	20DPNm05	Exercise for Muon Precision Measurement II a	2		
	20DPNm06	Exercise for Muon Precision Measurement II b	2		
Nuclear Physics	20DPNn01	Nuclear Physics I	2	In this lecture, strangeness nuclear physics to study hypernuclei with strange quarks and related topics will be shown. You will learn its history, experimental methods and apparatus, and results including recent topics. Basic knowledge on ordinary nuclei will be given as necessary. In particular, experiments at J-PARC Hadron Experimental Facility will be explained not only the present ones but also future plan.	TAKAHASHI, Toshiyuki
	20DPNn02	Nuclear Physics II	2		
	20DPNn03	Exercise for Nuclear Physics I a	2	Advanced exercise for Nuclear Physics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNn04	Exercise for Nuclear Physics I b	2		
	20DPNn05	Exercise for Nuclear Physics II a	2		
	20DPNn06	Exercise for Nuclear Physics II b	2		
Physics of Short-Lived Nuclei	20DPNo01	Physics of Short-Lived Nuclei I	2	Advanced lecture on Physics of Short-Lived Nuclei.	WADA, Michiharu
	20DPNo02	Physics of Short-Lived Nuclei II	2		
	20DPNo03	Exercise for Physics of Short-Lived Nuclei I a	2	Advanced exercise for Physics of Short-Lived Nuclei.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNo04	Exercise for Physics of Short-Lived Nuclei I b	2		
	20DPNo05	Exercise for Physics of Short-Lived Nuclei II a	2		
	20DPNo06	Exercise for Physics of Short-Lived Nuclei II b	2		
Neutron Fundamental Physics	20DPNp01	Neutron Fundamental Physics I	2	Advanced lecture on Neutron Fundamental Physics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNp02	Neutron Fundamental Physics II	2		
	20DPNp03	Exercise for Neutron Fundamental Physics I a	2	Advanced exercise for Neutron Fundamental Physics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNp04	Exercise for Neutron Fundamental Physics I b	2		
	20DPNp05	Exercise for Neutron Fundamental Physics II a	2		
	20DPNp06	Exercise for Neutron Fundamental Physics II b	2		
Experimental Cosmophysics	20DPNq01	Experimental Cosmophysics I	2	Advanced lecture on Experimental Cosmophysics.	HAZUMI, Masashi
	20DPNq02	Experimental Cosmophysics II	2		
	20DPNq03	Exercise for Experimental Cosmophysics I a	2	Advanced exercise for Experimental Cosmophysics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNq04	Exercise for Experimental Cosmophysics I b	2		
	20DPNq05	Exercise for Experimental Cosmophysics II a	2		
	20DPNq06	Exercise for Experimental Cosmophysics II b	2		

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Beam Dynamics	20DPNr01	Beam Dynamics I	2	Advanced lecture on Beam Dynamics. The control methods of the charged particles by the electromagnetic field, namely design principles of accelerators, beam lines, and magnetic spectrometers, will be lectured. The lecture consists of the motion of charged particles in the electromagnetic field, that is basic knowledge in elementary particle and nuclear physics experiments, and the structure of electromagnets and their production method.	TANAKA, Kazuhiro
	20DPNr02	Beam Dynamics II	2		
	20DPNr03	Exercise for Beam Dynamics I a	2	Advanced exercise for Beam Dynamics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNr04	Exercise for Beam Dynamics I b	2		
	20DPNr05	Exercise for Beam Dynamics II a	2		
	20DPNr06	Exercise for Beam Dynamics II b	2		
Superconductivity and Cryogenic Engineering	20DPNs01	Superconductivity and Cryogenic Engineering I	2	Advanced lecture on Superconductivity and Cryogenic Engineering. Mainly superconducting magnets including their cryogenics for particle or cosmic ray detectors are studied.	MAKIDA, Yasuhiro
	20DPNs02	Superconductivity and Cryogenic Engineering II	2		
	20DPNs03	Exercise for Superconductivity and Cryogenic Engineering I a	2	Advanced exercise for Superconductivity and Cryogenic Engineering. As a practical experience, taking a part of operation of a superconducting magnet system is planned. And winding and fabricating superconducting small magnet and its cryostat is also planned.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNs04	Exercise for Superconductivity and Cryogenic Engineering I b	2		
	20DPNs05	Exercise for Superconductivity and Cryogenic Engineering II a	2		
	20DPNs06	Exercise for Superconductivity and Cryogenic Engineering II b	2		
Particle Detection Technology	20DPNt01	Particle Detection Technology I	2	This course presents the fundamental concepts that underlie detection system for accelerator science applications. The students will learn about the sensors, signal processing, data acquisition and related technologies.	TANAKA, Manobu
	20DPNt02	Particle Detection Technology II	2		UCHIDA, Tomohisa
	20DPNt03	Exercise for Particle Detection Technology I a	2	Advanced exercise for Particle Detection Technology. I: 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). II: A lab-intensive introduction to basics of digital Integrated Circuit(IC) design skills through design exercises, discussion and hands-on lab exercises using Field Programmable Gate Array (FPGA) designing tools for detection and/or control system development.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNt04	Exercise for Particle Detection Technology I b	2		
	20DPNt05	Exercise for Particle Detection Technology II a	2		
	20DPNt06	Exercise for Particle Detection Technology II b	2		
Common Subjects for Theoretical Particle and Nuclear Physics	90DPNu01	Special Seminar for Theoretical Particle and Nuclear Physics I	4	Studying basic methods in theoretical particle and nuclear physics through seminars and discussions based on standard textbooks and articles.	All Faculty Members
	90DPNu02	Special Seminar for Theoretical Particle and Nuclear Physics II	4		
	90DPNu03	Special Seminar for Theoretical Particle and Nuclear Physics III	4		
	90DPNu04	Special Study for Theoretical Particle and Nuclear Physics I	4	Doing research of specific problems in the frontiers of theoretical particle and nuclear physics under the guidance by faculty members .	
	90DPNu05	Special Study for Theoretical Particle and Nuclear Physics II	4		
Common Subjects for Experimental Particle and Nuclear Physics	90DPNv01	Exercise for Particle and Nuclear Physics I	4	Experimental research for specific subject on elementary particle physics/nuclear physics under the guidance of thesis adviser.	All Faculty Members
	90DPNv02	Exercise for Particle and Nuclear Physics II	4		
	90DPNv03	Exercise for Particle and Nuclear Physics III	4		
	90DPNv04	Exercise for Particle and Nuclear Physics IV	4		
	90DPNv05	Exercise for Particle and Nuclear Physics V	4		