Special Subjects of the Department of Particle and Nuclear Physics

Field	Course Code	Subject	Credit	Content of subject	Instructor
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.	KANEKO, Takashi
	20DPNa02**	Introduction to Field Theory Ⅱ	2		NISHIMURA, Jun
	20DPNa11**	Advanced Field Theory Ⅰ	1	Numerical methods which enable nonperturbative studies of field theory.	
	20DPNa08**	Advanced Field Theory Ⅱ	2	Approaches to investigate non-perturbative aspects of (quantum) field theories including the topological classification of field configurations.	ISO, Satoshi
	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.	YAMADA, Norikazu
	20DPNa10**	Seminar on Field Theory Ⅱ	2		MUKAIDA, Kyohei
	20DPNa12**	Seminar on elementary theoretical physics	2	Seminars to learn basic knowledge and skills of elementary physics required to start studies in theoretical particle and nuclear physics.	YAMADA, Norikazu
Superstring Theory	20DPNw01**	Superstring Theory Ⅰ	2	Basics and the formulations of supergravity, which appears as an effective theory of superstring theory, focusing on four-dimensional N=1 supergravity, which is interesting from the phenomenological viewpoint.	SAKAMURA, Yutaka
	20DPNw02**	Superstring Theory Ⅱ	2	Lectures on modern methods for obtaining non-perturbative effects (string duality, algebro-geometric methods, etc.) necessary for applying string theory to realistic model building.	MIZOGUCHI, Shun'ya
Particle Physics Phenomenology	20DPNb01**	Theoretical Particle Physics Ⅰ	2	Lectures on the Standard Model of elementary particle physics based on experimental results.	ENDO, Motoi
	20DPNb02**	Theoretical Particle Physics Ⅱ	2		KITANO, Ryuichiro
	20DPNb06**	Particle Phenomenology	1	Lectures and seminars to understand unsolved problems in particle physics and the theory beyond the Standard Model in relation with recent related experimental data.	ENDO, Motoi
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.	KANEKO, Takashi
Hadron and Nuclear Theory	20DPNd05**	Introduction to Hadron and Nuclear Physics Theory	2	Lectures on hadron and nuclear physics from a theoretical viewpoint at an introductory level. In particular, lectures will be focused on the static and dynamic properties of hadrons under vacuum and extreme conditions such as high temperature and high density.	HIDAKA, Yoshimasa
	20DPNd04**	Theoretical Hadron Physics	1	Hadron physics theories based on QCD.	DOTE, Akinobu
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 theoretical cosmology related to the early Universe, high energy astrophysics and astro-particle physics.	KOHRI, Kazunori
	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.	MATSUBARA, Takahiko
	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.	KOHRI, Kazunori
	20DPNe06**	General Relativity	1	The goal of this lecture is to learn the basics of general relativity and cosmology. First we will study the basics of general relativity and subsequently the gauge invariant perturbation theory on which the modern cosmology is based. We also study various applications of the perturbation theory to observational cosmology. If time permits, we can also learn about quantum field theory in a curved spacetime and its applications.	URAKAWA, Yuko
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.	NAGANO, Kunihiro
	20DPNf02**	Introduction to Nuclear Physics	2	Introductory lecture on Nuclear Physics focusing on Experimental Aspects.	OZAWA, Kyoichiro

Field	Course Code	Subject	Credit	Content of subject	Instructor
B Factory	20DPNg01**	B Factory Ⅰ	2	Advanced lecture on B Factory.	ITOH, Ryosuke
	20DPNg02**	B Factory Ⅱ	2		
	20DPNg03**	Exercise for B Factory Ⅰa	2	Advanced exercise for B Factory.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNg04**	Exercise for B Factory Ⅰb	2		
	20DPNg05**	Exercise for B Factory Ⅱa	2		
	20DPNg06**	Exercise for B Factory Ⅱb	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 Ⅰa	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 Ⅰb	2		
	20DPNh05**	Exercise for Hadron Collider Energy Frontier Ⅱa	2		
	20DPNh06**	Exercise for Hadron Collider Energy Frontier Ⅱb	2		
Lepton Collider Energy Frontier	20DPNi01**	Lepton Collider Energy Frontier Ⅰ	2	Advanced lecture on Lepton Collider Energy Frontier.	JEANS, Daniel Thomelin Dietrich
	20DPNi02**	Lepton Collider Energy Frontier Ⅱ	2		
	20DPNi03**	Exercise for Lepton Collider Energy Frontier Ⅰa	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 Ⅰb	2		
	20DPNi05**	Exercise for Lepton Collider Energy Frontier Ⅱa	2		
	20DPNi06**	Exercise for Lepton Collider Energy Frontier Ⅱb	2		
Neutrino Physics	20DPNj01**	Neutrino Physics Ⅰ	2	Advanced lecture on Neutrino Physics. Elementaly particle physics preparation at least at the level of "Introduction to Elementary Particle Physics" 20DPNf01 taken is required.	SAKASHITA, Ken NAKADAIRA, Takeshi
	20DPNj02**	Neutrino Physics Ⅱ	2	Advanced lecture on Neutrino Physics. Understanding on the contents of "Neutrino Physics Ⅰ" 20DPNj01 is required.	
	20DPNj03**	Exercise for Neutrino Physics Ⅰa	2	Advanced exercise for Neutrino Physics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNj04**	Exercise for Neutrino Physics Ⅰb	2		
	20DPNj05**	Exercise for Neutrino Physics Ⅱa	2		
	20DPNj06**	Exercise for Neutrino Physics Ⅱb	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 Ⅰa	2	Advanced exercise for Kaon Rare Decay.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNk04**	Exercise for Kaon Rare Decay Ⅰb	2		
	20DPNk05**	Exercise for Kaon Rare Decay Ⅱa	2		
	20DPNk06**	Exercise for Kaon Rare Decay Ⅱb	2		
Muon Rare Process	20DPNl01**	Muon Rare Process Ⅰ	2	Advanced lecture on Muon Rare decay experiment. Lectures on fundamental properties of muon as an elementary particle and their precision measurements.	MIHARA, Satoshi
	20DPNl02**	Muon Rare Process Ⅱ	2		NISHIGUCHI, Hajime
	20DPNl03**	Exercise for Muon Rare Process Ⅰa	2	Advanced exersice for Muon Rare Process.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNl04**	Exercise for Muon Rare Process Ⅰb	2		
	20DPNl05**	Exercise for Muon Rare Process Ⅱa	2		
	20DPNl06**	Exercise for Muon Rare Process Ⅱb	2		

Field	Course Code	Subject	Credit	Content of subject	Instructor
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 Ⅰa	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 Ⅰb	2		
	20DPNm05**	Exercise for Muon Precision Measurement Ⅱa	2		
	20DPNm06**	Exercise for Muon Precision Measurement Ⅱb	2		
Nuclear Physics	20DPNn01**	Nuclear Physics Ⅰ	2	In this lecture, strangeness nuclear physic 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 paticu;ar, 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 Ⅰa	2	Advanced exercise for Experimental Nuclear Physics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNn04**	Exercise for Nuclear Physics Ⅰb	2		
	20DPNn05**	Exercise for Nuclear Physics Ⅱa	2		
	20DPNn06**	Exercise for Nuclear Physics Ⅱb	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 Ⅰa	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 Ⅰb	2		
	20DPNo05**	Exercise for Physics of Short-Lived Nuclei Ⅱa	2		
	20DPNo06**	Exercise for Physics of Short-Lived Nuclei Ⅱb	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 Ⅰa	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 Ⅰb	2		
	20DPNp05**	Exercise for Neutron Fundamental Physics Ⅱa	2		
	20DPNp06**	Exercise for Neutron Fundamental Physics Ⅱb	2		
Experimental Cosmophysics	20DPNq01**	Experimental Cosmophysics Ⅰ	2	Advanced lecture on Experimental Cosmophysics.	HAZUMI, Masashi
	20DPNq02**	Experimental Cosmophysics Ⅱ	2		HAZUMI, Masashi
	20DPNq03**	Exercise for Experimental Cosmophysics Ⅰa	2	Advanced exercise for Experimental Cosmophysics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNq04**	Exercise for Experimental Cosmophysics Ⅰb	2		
	20DPNq05**	Exercise for Experimental Cosmophysics Ⅱa	2		
	20DPNq06**	Exercise for Experimental Cosmophysics Ⅱb	2		

Field	Course Code	Subject	Credit	Content of subject	Instructor
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.	TAKAHASHI, Hitoshi
	20DPNr02**	Beam Dynamics Ⅱ	2		
	20DPNr03**	Exercise for Beam Dynamics Ⅰa	2	Advanced exercise for Beam Dynamics.	Faculty member (experimental research field) of the department of Particle and Nuclear Physics
	20DPNr04**	Exercise for Beam Dynamics Ⅰb	2		
	20DPNr05**	Exercise for Beam Dynamics Ⅱa	2		
	20DPNr06**	Exercise for Beam Dynamics Ⅱb	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 detecotors are studied.	MAKIDA, Yasuhiro
	20DPNs02**	Superconductivity and Cryogenic Engineering Ⅱ	2		
	20DPNs03**	Exercise for Superconductivity and Cryogenic Engineering Ⅰa	2	Advanced exersice for Superconductivity and Cryogenic Engineering.As a prctical 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 Ⅰb	2		
	20DPNs05**	Exercise for Superconductivity and Cryogenic Engineering Ⅱa	2		
	20DPNs06**	Exercise for Superconductivity and Cryogenic Engineering Ⅱb	2		
Particle Detection Technology	20DPNt01**	Particle Detection Technology Ⅰ	2	This course presents the fundamental concepts that underlie detectotion system for accelerator science applications. The students will learn about the sensors, signal processing, date acquisition and related technologies.	TANAKA, Manobu
	20DPNt02**	Particle Detection Technology Ⅱ	2		TANAKA, Manobu
	20DPNt03**	Exercise for Particle Detection Technology Ⅰa	2	Advanced exersice 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 Ⅰb	2		
	20DPNt05**	Exercise for Particle Detection Technology Ⅱa	2		
	20DPNt06**	Exercise for Particle Detection Technology Ⅱb	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		

A two-digit number or letter will be entered to ** according to the semester or the lecturer in charge.