Common Specialized Basic Subjects of the School of Physical Sciences

Subject Code	Subject	Credit	Content of subject	
10SPS001	Introduction to Observational Astronomy Ⅰ	2	We will give a contemporary view of the Universe, obtained from optical, infrared, and radio observations on stars, interstellar matter, galaxy and cluster of galaxies.	R. Kawabe M. Tanaka K. Nakanishi
10SPS002	Introduction to Observational Astronomy Ⅱ	2	Structure, origin and evolution of solar system bodies such as planets and satellites.	E. Kokubo
10SPS003	Introduction to Theoretical Astronomy	2	We will discuss contemporary view of theoretical astronomy and astrophysics. Subjects include the big-bang cosmology, the formation and evolution of stars and galaxies, the origin of the Solar system, and others.	K. Tomisaka T. Kajino
10SPS004	Space Science	2	Reviews of the development of astrophysics and solar system physics are given. Scientific issues are discussed and possible future plans are introduced. Methods of investigation using satellites, spacecraft and sounding rokets are also explained.	Dept.Space and Astronautical Science All the staff
10SPS005	Space Engineering	2	Technologies for space science, exploration, and utilization are overviewed. System design of launch vehicle and spacecraft, mission analysis of space systems, orbit control and determination, and project management are lectured by professional personnel in each field.	Dept.Space and Astronautical Science All the staff
10SPS006	Quantum Molecular Science	2	This couse covers quantum chemistry and spectroscopy. Topics include electronic structure theories, light-matter interactions, and spectroscopies which are essential to understand chemical bonds, molecular structures, and relaxation processes.	Shinji Saito Masahiro Ehara Kenji Ohmori Hiromi Okamoto
10SPS007	Introduction to Solid State Physics & Chemistry	2	Basic theories concerning solid state physics will be introduced: structures, thermal properties, electronic structures, transport properties, magnetism, superconductivity, etc.	Toshihiko Yokoyama Masahiro Hiramoto
10SPS008	Fundamentals of Fusion Science	2	The lecture is an introduction to basic plasma physics and reactor system engineering for nuclear fusion describing the history and present status of the fusion research. Lectures are given in English to facilitate the foreign students' understanding. The objective is to obtain the overall understanding of fusion research.	Members of dept. of fusion science
10SPS009	Overview of Simulation Science	2	History from the birth of numerical computation through the development of the latest simulation science is reviewed as well as research methodology of the simulation science based on super-computers and graphical visualization. Non-linear and complex plasma phenomena and self-organization dynamics are explained. Relation between theoretical models and simulation results is explored and comparison among different physical hierarchies is outlined.	Members of dept. of fusion science
10SPS021	Basic exercise on physics and engineering Ⅰ	2	In this exercise program, the fundamental knowledges to start the experimental research on fusion plasmas are given. In the program, the fundamental knowledges and techniques in using and designing (1) the vacuum instruments, (2) the measurement system of electric signals and (3) the high current/voltage electric power supply are given.	Members of dept. of fusion science
10SPS022	Basic exercise on physics and engineering Ⅱ	2	Maneuver to acquire necessity and indispensable technology for research using fusion experiment device. It maneuvers aiming to acquire the base technology of the radiation handling, the high pressure gas and cryogenic equipment handling, and the material forming processing and evaluation.The steady learning of the handling of the radiation from the research beginning step is especially important for safe operation of the fusion reactor.The base of the handling technology of the cryogenic system including attention as the high pressure gas facility that is acquired for the magnetic confinement fusion reactor as the superconducting coil and cryogenic system.The handling technology based on academic understanding of the material property is acquired about the characteristic, the formation processing, and the performance evaluation of various materials that compose each equipment in the fusion reactor.	Members of dept. of fusion science
10SPS023	Basic exercise on physics and engineering Ⅲ	2	Excersizes to obatain the basic knowledge and techniques needed for theoretical and numerical approaches are given. This subject is composed of the physical mathematics, the computer usage and programing, and the visualization.	Members of dept. of fusion science

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10SPS010	Space and Astronautical Science	1	This online lecture (E-learning) provides an overview of the researches and activities having conducted in the Department of Space and Astronautical Science, which includes scientific issues on astrophysics and solar system physics as well as technical issues on spacecraft and rocket.	Tadayasu Dotani Hideo Matsuhara Yasuhiro Morita Takumi Abe Masanao Abe Ikkoh Funaki Takahide Mizuno Issei Yamamura Makoto Yoshikawa
10SPS011	Overview of Control Engineering	1	In this lecture, it is kept in mind to do the control design in an actual system. Basic principles and their applications are lectured on the control engineering. Especially, applications are given with examples of the design in real situations.	Members of dept. of astronomical science, dept. of fusion science and dept. of space and astronautical science
10SPS012	Overview of Signal Processing	1	Basic theories of digital signal processing are explained that are indispensable for digitized data analyses of physics measurements. Fundamental principles for analog-to-digital conversion, error handling, encoding, data mining, filtering, and telecommunication are also reviewed.	Members of dept. of astronomical science, dept. of fusion science and dept. of space and astronautical science
10SPS013	Training of Presentation in English	1	In order to facilitate presentations in international conferences, presentation techniques are trained by specialists in English conversation. This class enphasizes practice on how to present and how to prepare presentaion documents.	Members of each dept. , visiting lecturers
10SPS014	Introduction to biomolecular simulation	1	Basic theories and computational methods for molecular simulations for biomoleculs will be introduced. For example, basic and various advanced methodologies for molecular simulations as well as fundamentals of analytical mechanics and statistical mechanics will be lectured.	Shinji Saito, Hisashi Okumura
10SPS015	Fundamental Theoretical Chemistry	2	This course gives an introductory overview of fundamental theory of quantum chemistry. A special emphasis is placed on understanding a basic idea of electronic structure calculations of molecular properties.	Masahiro Ehara
10SPS016	Fundamental Photo-science	2	Photoexcitation and photoionization processes can provide detailed information on the molecular properties and are in widespread use of the physical and chemical sciences. This lecture provides the student with a firm grounding in the basic principles and experimental techniques employed. Use of case studies illustrates how photoabsorption and photoelectron spectra are assigned and how information can be extraced.	Satoshi Kera Toshiki Sugimoto
10SPS017	Fundamental Chemistry and Physics of Solids	2	To understand fundamental physical properties of solid materials, basic principles concerning solid state physics will be discussed. Structures, thermal properties, electronic structures, transport properties, magnetism, and superconductivity of solids will be introduced.	Toshihiko Yokoyama Hiroshi Yamamoto
10SPS018	Fundamentals of Biomolecular Science	2	Core aspects of biophysical chemistry will be overviewed with the life-science student in mind. This course aims at cultivating the fundamentals necessary to complete the advanced courses of Structural Biomolecular Science and of Functional Biomolecular Science. The lectures will be given with life-science examples using a textbook covering the lows of thermodynamics, biological standard state, chemical equilibrium and its temperature dependence, chemical kinetics, enzyme kinetics, and molecular dynamics.	Shuji Akiyama Ryota Iino Nobuyasu Koga
10SPS019	Introduction to Coordination Chemistry	2	Structure and bonding of transition metal complexes including organometallic complexes, with emphasis on electronic structures, spectroscopy, and elementary reactions.	Shigetoshi Aono Shigeyuki Masaoka
10SPS020	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.	Hiromi Okamoto Hiroshi Matsuo Hideya Nakanishi Tetsuo Yoshimitsu
10SPS024	Basic digital circuit design and development for measurement and control systems	1	Learn the basic digital circuit design technology for developing measurement control systems applied in actual experimental researches. Interactive instructions through the lecture practices effectively help the trainee acquiring adequate knoledges and skills.	Hideya Nakanishi