Special Subjects of the Department of Space and Astronautical Science

Field	Course Code	Subject	Credit	Content of subject	Instructor
Space Observation Science	20DSA001**	Space Observation Science	2	Fundamental methods of mission analysis and design for space-science experiments are lectured from the understanding of background physics and its methods.	Tsuneo Kii Keiichi Matsuzaki
	20DSA002**	Space Systems Engineering Ⅰ	2	Basic theories, technologies and project management of the space system including the satellites and the scientific balloons will be lectured, and their applications, current subjects and future prospects will be discussed.	Tetsuya Yoshida Shujiro Sawai
	20DSA003**	Space Systems Engineering Ⅱ	2	The rocket systems engineering associated with launch and reentry of space vehicles is thoroughly lectured. Flight dynamics, guidance and control, thermal protection, and recovery systems etc. are reviewed in some detail. The lecture is extended to entry systems for planetary missions. Special topics involving system design processes, applications and future prospects are also discussed.	Tetsuya Yamada Masashi Miura Yasuhiro Morita
	20DSA004**	Space Systems Engineering Ⅲ	2	The orbit calculation and the orbit design/determination of solar system bodies and man-made space probes (artificial satellites and spacecraft) are lectured. Various dynamical features are known for solar system bodies. The origins of such features and the methods of analysis will be discussed. As for the man-made space probes, the basic knowledge and methods for the orbit planning/determination will be discussed.	Makoto Yoshikawa Yasuhiro Kawakatsu
	20DSA005**	Space Systems Engineering Ⅳ	2	Space power systems and subsystems including power generation, storage, transmission, and management are lectured. The lecture covers basic and advanced power technologies, and future space energy systems for Solar Power Satellite and planetary exploration mission.	Koji Tanaka Yoshitsugu Sone
	20DSA006**	Space Environment Physics	2	High-energy plasma phenomena in the solar corona, such as flares and coronal mass ejections (CMEs), affect the space environment of the solar system. The lecture reviews observational aspects and mechanisms of such high-energy phenomena in the solar atmosphere, and discusses their effects on the near-Earth space environment.	Taro Sakao
Space Systems Engineering	20DSA007**	Introduction to Space Astronomy	2	This lecture gives an overview of the new view of the universe revealed by the observations in various wave bands. Observational technology is also reviewed with emphasis on that specific to the space missions. In the lecture, it is explained how various phenomena in the universe are understood based on the laws of physics, together with the telescope technology and the data analysis methods.	Tadayasu Dotani Toru Yamada
	20DSA008**	Space Astronomy Ⅰ	2	Give a lecture on various high-energy phenomena revealed through X-ray and Gamma-ray observations from satellites, and study the background physics behind the phenomena. Also given is a lecture on the principle and the actual configuration of X-ray and Gamma-ray instruments and the analysis methods of their data.	Manabu Ishida Motohide Kokubun
	20DSA009**	Space Astronomy Ⅱ	2	The lecture gives an overview of the recent picture of the Universe, especially the early Universe, the large scale structure, and formation and evolution of galaxies, stars, and planets, which have been revealed by infrared and submillimeter observations from space. Also gives brief descriptions of detection principle of infrared light from space, and the unique techniques used in the observational instrumentation and the data analysis.	Hideo Matsuhara Issei Yamamura
	20DSA010**	Space Astronomy Ⅲ	2	The lecture gives radio astronomy observations from satellites, especially space-VLBI obseravations and its results. The lecture also includes basics of the radio interferometry and ground interferomers and its results to understand the space-VLBI observation.	Yasuhiro Murata Akihiro Doi

Field	Course Code	Subject	Credit	Content of subject	Instructor
Solar System	20DSA011**	Introduction to Exploring the Solar System	2	The lecture treats origin and evolution of the planetary bodies and thier environment on a basis of the scientific results of recent planetary explorations, observation techniques, and the scientific instruments onboard spacecraft, focusing on the science of solarsystem small bodies and astrobaiology considering both extrasolar planets and solar system.	Masanao Abe Keigo Enya
	20DSA012**	Science of Planetary Exploration	2	The lecture gives an introduction of the area of solid planetary science, Especially, we discuss the practical methods of investigation of the surface and the internal structure of the solid planets by the space exploration. The goal of this lecutre is to understand how the obtained data are related to the origin and evolution of the planets.	Takahiro Iwata Satoshi Tanaka
	20DSA013**	Physics of Planetary Atmospheres	2	The lecture gives the basic physics of planetary atmospheres and the overview of atmospheric structures and physical processes observed so far. Unsolved problems to be addressed in future spacecraft missions will also be discussed.	Takumi Abe Takehiko Satoh
	20DSA014**	Solar System Plasma Physics	2	The solar system is a laboratory where dynamics of energetic plasma in the universe can be studied in situ by state-of- the-art instruments on board spacecraft. This lecture provides basic knowledge of physical processes occurring in the plasma environment of the solar system, including the solar wind, ionospheres, and magnetospheres around the planets. Scientific objectives of space missions both for magnetized and unmagnetized planets are described, with the reference to the innovative techniques for the plasma measurements in space.	Takeshi Takashima Kazushi Asamura
Astronautics	20DSA015**	Spacecraft Propulsion Ⅰ	2	The lecture describes theories and experimental methods on thermo-fluid engineering for space transportation system. It includes specific examples as well as basic technology.	Shinichiro Tokudome Hiroaki Kobayashi
	20DSA016**	Spacecraft Propulsion Ⅱ	2	Starting from the basic concepts of both chemical and advanced propulsion systems, practical application of these concepts to space transportations and space probes are provided. Topics include state-of-the-art rocket motors, air breathing engines, propulsive method for orbital transfer vehicles, as well as in-space electric and other advanced propulsion systems.	Ikkoh Funaki Yusuke Maru
	20DSA017**	Space Structures and Materials Ⅰ	2	The class focuses on the structure and the materials of spacecraft including flexible structure and deployable structure. The lecture describes their feature and provides the fundamental knowledge required in the design and development of spacecraft structure and materials.	Yasuyuki Miyazaki
	20DSA018**	Space Structures and Materials Ⅱ	2	The lecture gives patterns, design methods, component materials, and on-board mechanisms of structures for spacecraft and rockets.	Shinsuke Takeuchi
	20DSA019**	Space Applied Physical Chemistry	2	The purpose of the lecture is to deepen the knowledge of materials which have been used for the spacecraft from the aspect of chemistry. With the basic lecture of chemistry, the fuel cell, oxygen generator, CO2 removal/reduction, the film material, chemical propellant and other materials will be described from the view point of chemistry. The malfunctions of the spacecraft caused by the chemical reaction will also be discussed. Furthermore, the special material chemistry using the special space environment like microgravity conditions is also described as the future aspects of chemistry and material engineering. The background of the thermodynamics and thermochemistry will also be discussed.	Takehiko Ishikawa Yoshitsugu Sone
	20DSA020**	Introduction to electronics and information for space applications	2	The course includes onboard and ground telecommunication techonologies of spacecraft for understanding fundamentals of technologies supporting information society.	Tomoaki Toda Zen-ichi Yamamoto

Field	Course Code	Subject	Credit	Content of subject	Instructor
Astronautics	20DSA021**	Electronics and information for space applications Ⅰ	2	The lecture gives basic circuit design and semiconductor device technologies with special emphasis on scientific foundations locating underneath the technologies. Further, RF circuits and small antennas for space communication are introduced. Special interest is put on characteristic measurement of high-power and low-noise circuits in a fur-disitance of deep space are discussed.	Atsushi Tomiki
	20DSA022**	Electronics and information for space applications Ⅱ	2	- The lecture gives the methods of attitude determination, attitude control, navigation and guidance of spacecraft, including sensors and actuators technologies. - This lecture also summarizes the tchnologies used in space exploration robots, and discusses how to design and build robots which explore the various surfaces of celestial bodies in the solar system. - Hands-on practice of software implementation of a simple system including sensor data processing, actuator commanding, and hardware control.	Shin-ichiro Sakai Tetsuo Yoshimitsu
	20DSA023**	Introduction to Radiowave Engineering for Space Applications	2	We can find many radiowave applications in spacecraft systems, for example, a rocket tracking, a R&RR for trajectry determination, GPS, remote sensing. The lecture gives principles, hardware and signal processings of radar systems. It includes latest informations of space radars and a laser ranging technology for spacecrafts.	Takahide Mizuno
	20DSA024**	Computational engineering and science	2	Computational science based on the numerical simulation technologies stands with theory and experiments, being an important research and developping tool in the ace science field. This lecture introduces the leading edge technologies in numerical simulation, data assimilation, data visualization and high performance computing which support them and related technologies especially from the engineering perspective. Also the high performance computing and related topics, which support computational engineering and science are introduced.	Ryoji Takaki Akira Miura
	20DSA028**	Space Life Science	2	In this lecture, we mainly explain how humans live in space and life in the extreme environment. The former describes the basic laws of the universe, space experiments using the space environment, the history of space exploration, space elevators, terraforming, space agriculture, exoplanets, and so on. The latter describes the basic environmental microbiological findings that lead to life exploration and astrobiology research such as the constituent molecules of life, the microbial energy metabolism, the habitat of life, and the origin of life. And the analytical technology and the latest research trends will be described.	Hirofumi Hashimoto Shino Suzuki
	20DSA027**	Materials Engineering in Space	2	This program explains the materials science research under the microgravity offered by orbital space platforms where buoyancy convections are fully suppressed and containerless conditions (levitation-positioning) can be easily obtained. Previous experiments, including their research facilities and experimental techniques, are also described. For containerless processing, electrostatic levitation techniques and related studies that include thermophysical property measurements and synthesis of metastable materials will be discussed in details. In addition, research in crystal growth mechanism and production of high quality crystals of semiconductor in microgravity are introduced.	Yuko Inatomi Takehiko Ishikawa

Field	Course Code	Subject	Credit	Content of subject	Instructor
Common cources	90DSA001**	Space science colloquium Ⅰ	4	In depth insight into various fields of space science will be cultivated though discussion of colloquium type lectures.	Supervisors
	90DSA002**	Space science colloquium Ⅱ	4		
	90DSA003**	Space science colloquium Ⅲ	4		
	90DSA004**	Space science colloquium Ⅳ	4		
	90DSA005**	Space science colloquium Ⅴ	4		
	90DSA006**	Thesis Progress Report Ⅰ	2	Students in the 2nd year of the 5-year ourse write a progress report on his/her thesis-related research that he/she has pursued in the first and second years. Oral presentation of the report is also required.	Chair of Department of Space and Astronautical Science
	90DSA007**	Thesis Progress Report Ⅱ	2	Students in the 4th year of the 5-year course or in the 2nd year of 3-year course write a progress report on his/her thesis-related research that he/she has pursued so far. Oral presentation of the report is also required.	Chair of Department of Space and Astronautical Science
	10DSA001**	Scientific writing Ⅰ	2	This class is to learn the scientific presentation and its practice in English mainly through exercises. This class starts with a short course in Japanese explicating "How to compose and write scientific articles". Lecture is given by a native English lecturer in addition to a Soken-dai Professor. (for students of English as a second language)	Takahiro Iwata
	10DSA002**	Scientific writing Ⅱ	2	Learn the basics of writing academic papers in English mainly through exercises. Lecture is given by a native English lecturer in addition to a Soken-dai Professor. (for students of English as a second language)	Takahiro Iwata
	20DSA034**	Field works	2	The credit of the field work is given to students for external studies which is planned voluntary and is carried over a total period longer than 2 weeks. The credit is given through examination based on the plan and resulting report by course committee members.	Chair of Department of Space and Astronautical Science

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