C: Compulsory Subject, E: Elective Subject

Third Semester (Fall 2015)				
Code	**Subject**	**Credit**	**C/E**	**Description**
0530039	Analytical Chemistry II **<Prof. Takeaki OZAWA >**	2	E	A survey of the methods of inorganic, organic and biomolecular quantitative/qualitative analysis, involving the methods of data handling, physical and chemical analysis with the use of simple instrumental methods included. 1. Experimental Error & Statistics 2. Quality Assuarance & Calibration Methods 3. Chemical Equilibrium 4. Acid-Base Equilibria 5. EDTA Titration 6. Fundamental of Spectrophotometry 7. Applications of Spectrophotometry 8. Mass Spectrometry 9. Analytical Separations 10. Chromatographic Methods & Capillary Electrophoresis 11. Electrochemistry 12. Electrodes & Potentiometry 13. Recent analytical topics (1)
0530054	Chemical Reactions **<Prof. Tatsuya TSUKUDA>**	4	E	This course is aimed to understand basic concepts of chemical reactions in gas phase, in liquid phase, and on surface from the viewpoints of macroscopic chemical kinetics and microscopic reaction dynamics. Main contents of the lecture are as follows. 1. Basics of chemical reaction theory 2. Chemical kinetics 3. Complex reactions and elementary reactions 4. Molecular collision and chemical reactions 5. Dynamics in chemical reactions 6. Statistical theory of chemical reactions 7. Chemical reactions in solution
0530062	Inorganic Chemistry III (Transition Metal Compounds and Solution Chemistry) **<Prof. Mitsuhiko SHIONOYA>**	2	E	This lecture gives you a detailed description of syntheses, steric and electronic structures, and chemical and physical properties of metal complexes, and focuses further on design methodology for molecular functions. Organometallic complexes and functional metal complexes in living systems are also discussed. Acquisition of elementary inorganic chemistry is desirable for this lecture. Abstract of this lecture is as follows. 1. History of coordination chemistry 2. Structures of metal complexes: Inorganic and organic ligand, stereoisomerism, stability 3. Crystal field theory: Ligand field, correlation of steric and electronic structures 4. Coordination bonding: Bond strength, kinetics and mechanism of ligand exchange, multiple bonding 5. Redox reactions of metal complexes, electron transfer, and electrochemistry 6. Photochemistry of metal complexes 7. Organometallic chemistry: 18-Electron rule, synthesis, structural analysis, (catalytic / photochemical) reactions 8. Bioinorganic chemistry: Structures and functions of metal complexes related with living body (general description only) 9. Supramolecular coordination chemistry: Design, synthesis, structure, and function of supramolecules 10. Future perspectives of coordination chemistry
0530061	Geochemistry **<Prof. Keisuke NAGAO>**	2	E	In order to understand various events occurred during 4.6 billion years on time-axis, absolute dating methods using radioisotopes and understanding of material evolution using variation of isotopic composition are explained in detail. Schedule of this lecture is as follows. 1. Stellar nucleosynthesis 2. Formation of solar system and composition of elements 3. Meteorites, isotopic compositions and their anomalies 4. Early solar system chronology 5. Formation and evolution of planets and the earth 6. Various dating methods 7. Geochemical cycle among geosphere, hydrosphere, and atmosphere 8. Isotope geochemistry

0530044	Organic Chemistry of Natural Products **<Prof. Kazuo TACHIBANA>**	2	E	Biosynthesis (organic synthesis in living cells) and biofunction of familiar natural products, here defined as small organic compounds produced by living organisms, are introduced. This lecture thus aims at understanding involvement by organic chemistry even in chemical reaction within biological bodies, and functions of natural products for maintaining living events, for example, communication among biological cells within and among biological individuals. Metabolic pathways and groups of compounds introduced in this lecture will be as follows. Reduction and oxidation (electron flow in carbon fixation, glycolysis through citric acid cycle) Fatty acid metabolism (biosynthesis and consumption of lipid, phospholipid bilayer membrane and conversion of biological information at the membrane) Isoprenoids (terpenoids, steroids, carotenoids) Polyketides (antibiotic, etc.) Shikimic acid metabolism (aromatic compounds like polyphenols) Nitrogeous natural products (amino acids, alkaloids, tetrapyrroles)
0530043	Organic Chemistry IV **<Prof. Shu KOBYASHI>**	2	E	Coming soon
0530064	Special Topics in Pysical Chemistry I **<Prof. in charge>**	2	E	Frontier studies in the fields of physical chemistry are introduced by four professors in physical chemistry in an omnibus form.
0530072	Quantum Chemistry III **<Prof. Kaoru YAMANOUCHI>**	2	E	On the basis of quantum mechanics and quantum chemistry given in the courses in Quantum Chemistry I-GSC and Quantum Chemistry II, students will learn (i) time-dependent processes, (ii) quantum theory of optical transitions, and (iii) group theory and its application to molecular vibration and molecular orbitals.
0530013	Laboratory Work in Physical Chemistry **<Prof. in charge>**	3	C	This is a laboratory course in physical chemistry. Students will learn a variety of experimental and data analysis methods related to structural chemistry, molecular spectroscopy, chemical reaction dynamics, solid state chemistry, and surface chemistry.