

Course Completion Roadmap

Acad. Year	1st Semester		2nd Semester	
1	Select 1 from ETS2001~2004	3	COR1001	2
	STS2005		COR1003	3
	CHM1001	3	Select 1 from :	3
	CHM1051	1	CHS2001~2004, 2009	
	Select 1 from	4	STS2006	3
	- A: PHY1001 and PHY1101		CHM1002	3
- B: BIO1101 and BIO1105		CHM1052	1	
Others	5	Select 1 from	4	
Total	19		- A: PHY1002 and PHY1102	
			- B: BIO1102 and BIO1106	
			Total	19
2	Select 1 from HFS2001~2003	3	CHM2201	3
	Select 1 from SHS2001~2007	3	CHM2302	3
	CHM2101	3	CHM2351	2
	CHM2151	2	Others	11
	CHM2301	3	Total	19
	Others	5		
Total	19			
3	CHM2202	3	CHM2451	3
	CHM2251	2	CHM2152 2252 2352 2651 중 1	2
	CHM2401	3	Others	14
	CHM2152 2252 2352 2651 중 1	2	Total	19
	Others	9		
	Total	19		
4	Others	19	Others	19

※ Recommend to take courses by selecting Applied Mathematics1(MAT2410) and Applied Mathematics2(MAT2420) or one group from two groups Algebra(MAT2110) and Differential Equation(MAT2230)

※ Required Core Course : Reflection and Growth(COR1007) will be taken in summer or winter season.

* Roadmap for English Language Course

Course planned for English Course in opening semester(Total 9 courses)

1st Semester Organic Chemistry III, Physical Chemistry III, Inorganic Chemistry I, Biochemistry II

2nd Semester Instrumental Analysis, Physical Chemistry III, Biochemistry I,

Polymer Chemistry, Theory of Organic Chemistry II

CHM1001 General Chemistry I 3 cr.
(lect.: 3hr.)

This course explores concepts in modern chemistry, including the properties of gases, thermochemistry, atomic structure, electronic configuration and the periodic table, the s-block elements, chemical bonds, bonding theory and molecular structure, intermole-

cular forces, and chemical reactions in aqueous solutions

CHM1002 General Chemistry II 3 cr.
(lect.: 3hr)

A study of physical properties of solutions, chemicals in Earth's atmosphere, chemical kinetics, chemical equilibrium,

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acid-base equilibrium, equilibrium involving complex ions, thermodynamics (concepts of spontaneity, entropy, and free energy), electrochemistry, the p-block elements, the d-block elements, and coordination compounds.

CHM1051 General Chemistry 1 cr. **Laboratory I**

(lab.: 3hr)

Laboratory safety and the handling of lab equipment are introduced. Also includes experiments on measuring mass and volume, determining the Avogadro number, measuring the heat of reactions, electronic transition and emission spectrum, synthesis of aspirin, acid-base titrations, and redox titrations.

CHM1052 General Chemistry 1 cr. **Laboratory II**

(lab.: 3hr)

This lab covers experiments on the extraction of caffeine, reaction kinetics, thin-layer chromatography, determination of equilibrium constants, qualitative analysis of cations, chemical cells and determination of cell potential, qualitative analysis of organic compounds and synthesis of nylon, preparation, and characteristics of transition metal complexes.

CHM2101 Analytical Chemistry 3 cr. (lect.: 3hr)

This course is designed to help students understand basic principles and techniques of quantitative chemical analysis including: error analysis, statistics, gravimetry, volumetric analysis, acid/base equilibrium, redox equilibrium, basic electrochemistry, and basic spectrophotometric analysis.

CHM2102 Instrumental Analysis 3 cr. (lect.: 3hr)

The following topics will be discussed: principles and applications of chemical measurements, analysis based on instrumental techniques, basic electronics, advanced electrochemistry, absorption, emission, and

fluorescence spectrophotometric techniques, X-ray diffraction, mass spectrometry, gas chromatography, and liquid chromatography.

CHM2151 Analytical Chemistry 2 cr. **Laboratory**

(lab.: 4hr)

This course is designed to help students practice analytical chemistry techniques including: calibration of volumetric glassware, standardization, gravimetric analysis, acid/base titrations, redox titrations, EDTA titration, and spectrophotometric analysis.

CHM2152 Instrumental Analysis 2 cr. **Laboratory**

(lab.: 4hr)

This course is designed to help students practice techniques of instrumental analysis, which include basic electronics (including data acquisition), spectrophotometric analysis based on absorption and emission techniques, cyclic voltammetry, gas chromatography, and liquid chromatography.

CHM2201 Physical Chemistry I 3 cr. (lect.: 3hr)

The following subjects are introduced and discussed: properties of gases, laws of thermodynamics, state change, chemical equilibrium, and equilibrium electrochemistry.

CHM2202 Physical Chemistry II 3 cr. (lect.: 3hr)

The following subjects are introduced and discussed: the theory and applications of quantum chemistry, structures and spectra of atoms, molecular structure, symmetry and group theory, molecular spectroscopy, and magnetic resonance.

CHM2203 Physical Chemistry III 3 cr. (lect.: 3hr)

The following subjects are introduced and discussed: kinetic theory of gases, chemical kinetics, chemical dynamics, surface phenomena, and dynamic electrochemistry.

CHM2231 Selected Topics in 3 cr.

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Physical Chemistry

(lect.: 3hr.)

The following subjects are introduced and discussed: statistical thermodynamics, X-ray diffraction, electric and magnetic properties of molecules, structures, and properties of macromolecules.

CHM2251 Physical Chemistry 2 cr. Laboratory I

(lab.: 4hr)

Experiments are performed on the following: chemical thermodynamics, chemical equilibrium, electrical conductivity of electrolytes, surface and interface phenomena, phase equilibrium, and thermodynamics of electrochemical cells.

CHM2252 Physical Chemistry 2 cr. Laboratory II

(lab.: 4hr)

Experiments on the following are performed: characterization by magnetic resonance and absorption spectroscopy, surface chemistry, and physical properties of macromolecules.

CHM2301 Organic Chemistry I 3 cr.

(lect.: 3hr)

This course is designed as the first half of a full-year course for students who want to learn organic chemistry for the first time. It covers basic concepts in organic chemistry such as structures and properties. Some topics include substitution, elimination, addition, oxidation, reduction, and radical reactions.

CHM2302 Organic Chemistry II 3 cr.

(lect.: 3hr)

This course is the continuation of CHM2301, as the second half of a full-year course. It covers basic organic chemistry concepts in greater detail. Some topics are hydrocarbons, stereo-chemistry, alkyl halides, alcohols and ethers, aldehydes, ketones, carboxylic acid, its derivatives, and spectroscopy.

CHM2303 Organic Chemistry III 3 cr.

(lect.: 3hr)

This is a continuation of CHM 2302 and is for students who are majoring in chemistry. The following topics are explored: aromatic compounds, molecular orbital theory, organic nitrogen compounds, heterocyclic molecules, biologically important natural products such as carbohydrates, amino acids, and peptides; fatty acids, and spectroscopic methods.

CHM2331 Selected Topics in 3 cr. Organic Chemistry I

(lect.: 3hr , prereq.: CHM2302)

In this course, chemical reactions are primarily emphasized and the theories discussed in CHM2301, 2302, and 2303 are explored in more depth. The topics are alkylation of the enolate or its equivalents, interconversions between organic functional groups, addition reactions to carbon-carbon unsaturated bonds and carbonyl groups, cycloaddition reactions, chemistry of organometallic compounds, and reactions of electrondeficient intermediate such as carbene and nitrene.

CHM2332 Selected Topics in 3 cr. Organic Chemistry II

(lect.: 3hr, prereq.: CHM2302)

This course explores several basic principles related to verifying and explaining the reaction mechanisms such as structures of intermediates and transition states, reactivity, and reaction kinetics. This course covers chemical bonding, stereochemistry, conformation, nucleophilic substitution, addition and elimination of alkyl halides, carbanions, and addition reactions to carbonyl compounds.

CHM2351 Organic Chemistry 2 cr. Laboratory I

(lab.: 4hr)

This is a basic laboratory course that is closely related to the topics in CHM2301. Students first learn the basic skills for the separation of mixtures (distillation, fractional distillation, steam distillation, extraction, recrystallization, and chromatography) and then work on reactions such

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as substitution and aldol. Also includes multistep synthesis including esterification, reduction, oxidation, the Wittig reaction, hydrogenation, and chemiluminescence.

CHM2352 Organic Chemistry 2 cr. **Laboratory II**

(lab.: 4hr, prereq.: CHM 2351)

This lab is a relatively higher-level laboratory course than CHM2351. The object of this course is to help students plan and perform their own projects by the end of semester. Three or four different multistep (4 to 6 steps) synthesis projects will be provided. Students are expected to finish one during the semester. Each topic includes useful chemical transformations and separation techniques, familiarizing students with laboratory work that is closely related to graduate-level organic synthesis and industrial work.

CHM2401 Inorganic Chemistry I 3 cr.

(lect.: 3hr)

The following subjects are introduced and discussed: structure of atoms, symmetry and group theory, chemical bonding in small molecules and inorganic compounds, molecular structure, property and reactivity of inorganic compounds (including solids), acid-based chemistry and oxidation reduction, property and reactivity of main group metal and non-metal elements, and an introduction to coordination chemistry of transition metals (bonding, spectrum, molecular structure, magnetic property, and reactivity of coordination compounds).

CHM2402 Inorganic Chemistry II 3 cr.

(lect.: 3hr)

The following subjects are introduced and discussed: coordination compounds of transition metals (reaction, kinetics, mechanism and applications), organotransition metal chemistry (18 electron rule, reactions, homogeneous catalysis), inorganic ring, chains, cages, clusters, chemistry of halogens and noble gases, and inorganic chemistry of biological systems.

CHM2451 Inorganic Chemistry 2 cr. **Laboratory**

(lab.: 4hr)

Experiments on the following are performed: synthesis and characterization of coordination, organometallic compounds and inorganic solids, kinetic measurements of inorganic reactions, purification/ separation of coordination and organometallic compounds through the physical measurements (X-ray diffraction of inorganic solids, infrared spectrum, electronic absorption spectrum, ¹H-NMR spectrum, molar conductance, EPR spectrum) using techniques for handling air- and moisture-sensitive materials.

CHM2501 Polymer Chemistry 3 cr.

(lect.: 3hr, prereq.: CHM2202)

The following subjects are introduced and discussed: polymer synthesis and mechanisms, chemical and physical properties of polymers, structure/properties relationship, and polymer materials.

CHM2601 Biochemistry I 3 cr.

(lect.: 3hr, prereq.: CHM2302)

Biochemistry is the study of biological molecules such as nucleic acids, proteins, lipids, and carbohydrates. This course introduces students to basic concepts and molecular mechanisms.

CHM2602 Biochemistry II 3 cr.

(lect.: 3hr, prereq.: CHM2601)

This course is a continuation of Biochemistry I and deals with signal transduction, metabolism, and the central dogma of molecular biology.

CHM2651 Biochemistry 2 cr. **Laboratory**

(lab.: 4hr)

This lab reviews techniques learned in Biochemistry I and II and applies them to biochemical experiments such as protein purification, gel electrophoresis, and PCR.

CHM4051 Research in Special Topics I 3 cr.

This course is designed for juniors and seniors who would like to perform state-of-the-art modern chemistry laboratory work under the guidance of a designated professor in the chemistry department. This course is optional.

CHM4052 Research in Special Topics II 3 cr.

This course is designed for juniors and seniors who would like to perform state-of-the-art modern chemistry laboratory work under the guidance of a designated professor in the chemistry department. This course is optional.

CHM4053 Chemistry in Industrial Technology (Lecture 2 hours and Experiment 2 hours) 3 Credits

This course targeting students in 3rd and 4th grades is taken in a way to advance the basic education of chemistry and customize the advanced chemistry area to companies. And in this course, students can conduct the projects related to the chemistry companies under the guidance of academic advisers and professionals in the companies.

CHM4054 Comprehensive Design of Chemical Appliance (Lecture 1hour, experiment practice 2 hours, and design 1 hour) 3 Credits

In this course, students majoring in chemistry can design new measuring devices required in the field related to chemistry and realize a new chemical experiment. And based on the knowledge and theory learned in the course of analytical chemistry and device analysis, students can plan and practice new chemical appliance.

CHM4055 Chemistry in Industrial

Technology 3 Credits

This course will be conducted in a way that professionals from industries or research center will provide the contents of work in the actual advanced field and academic advisors will explain about the part difficult to improve the understanding.

CHM4056 Chemical Industry and Internship 1 3 Credits

This course helps students apply the chemical theory learned in school to the industries in chemical areas and conduct field practice.

CHM4057 Chemical Industry and Internship 2 3 Credits

This course helps students apply the chemical theory learned in school to the industries in chemical areas and conduct field practice.

CHM4203 Chemical Patents and Technology Transfer (Lecture 1 hour) 1 Credit

This course covers the process required to make useful research result of chemical intellectual property rights(IPR) and related contents. To do so, this course helps students the importance of IPR, process to create the rights and the contents of technology transfer through the cases in the present system.

CHMG101Advanced Analytical Chemistry 3 cr.

(lect.: 3hr)

An advanced course of analytical chemistry; topics include acid/base chemistry in aqueous and non-aqueous solvents, solvent extractions, ion-exchange, and chromatographic analysis.

CHMG201Advanced Physical Chemistry I 3 cr.

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(lect.: 3hr)

The following subjects are introduced and discussed: advanced topics in quantum chemistry, statistical thermodynamics, spectroscopies, chemical thermodynamics, and physicochemical properties of matter.

CHMG202 Advanced Physical Chemistry II 3 cr.

(lect.: 3hr)

This course is a continuation of CHMG201.

CHMG301 Advanced Organic Chemistry I 3 cr.

(lect.: 3hr, prereq.: CHM2302)

This course is intended for high-level undergraduate students and first-year graduate students. It deals with several selected topics such as chemical bonding and reaction mechanisms (from the viewpoints of physical and organic chemistry), relationships between chemical structures, reaction conditions and reactivities, molecular orbital theory and its application, photochemistry, radical reactions, and biosynthesis.

CHMG302 Advanced Organic Chemistry II 3 cr.

(lect.: 3hr, prereq.: CHM2302)

This course is intended for high-level undergraduate students and first-year graduate students. It covers the basic principles of many important spectroscopic methods such as NMR of ^1H and ^{13}C , IR, UV, Mass, etc. Lots of problem-solving exercises are also provided for students to deduce the chemical structure of unknown samples from various kinds of spectroscopic data.

CHMG401 Advanced Inorganic Chemistry 3 cr.

(lect.: 3hr)

The following subjects are introduced and discussed: property, synthesis and characterization of organometallic compounds; reactions of organometallic compounds (oxidative addition, reductive elimination, insertion, β -hydrogen elimination), homoge-

neous catalysis by organometallic compounds (polymerization, activation of CO , CO_2 , alkane, various unsaturated organic molecules), and bioorganometallic chemistry.

CHMG402 Inorganic Material Chemistry 3 Credits

This course covers Nano material, quantum dot, quantum wire, semi-conductor, superconductor, magnetics material, dielectric, solar panel related inorganic material, inorganic materials related to display, structure and nature of porous materials and its application.

CHMG601 Writing and Presentation Method of Natural Science Papers 3 Credits

This courses focuses on improving the ability to write English paper and ability to present the paper needed to grow as independent researcher.

<Teaching Profession Course>

※ Only for students completing teaching profession, this course can be approved as the course for major and for students not completing teaching profession, this course is approved as general arts credit.

EDUS981 Education Theory on Science Course 3 Credits

This course takes a look at various theories and views for the goal, contents, method and evaluation of chemistry course and analyzes concretely the bio-science course in the middle and high schools.

EDUS982 Logics and Essay on Science Course 3 Credits

This course helps students improve the thoughts and the ability to teach essay with the contents and principles of bio-science or science based on the overall understanding of the structure and nature of bio-science course.

Undergraduate Curriculum

EDUS983 Study and Teaching Method of Science Course Textbook

This course helps students improve the ability to practice the teaching of bio-science course through understanding

the systematic analysis on bio-science course and textbook in the middle and high schools and the theory and practice of bio-science teaching method.