Main course

Course name	Class hours	Examination type	Textbook	syllabus
Principles of General Chemistry	64 class hours ,one semester	closed book examination	<Inorganic Chemistry>, fourth edition, Dalian University of Technology series, Higher Education Press	The course is base on the content of chemistry in secondary school, and focuses on chemical fundamental problems and chemical methods. It includes the fundamental knowledge of aggregation substance, atomic structure, molecule structure, chemical bonding, complex structure, preliminary chemical thermodynamics, rate theory of the chemical reaction, chemical equilibrium, electrochemistry, and redox reaction.
Physical Chemistry	112 class hours, two semesters	closed book examination (English)	<Physical Chemistry> Zhu Wentao, Tsinghua University Press, <Physical Chemistry> Fourth Edition volumes, Fu Xiancai, Higher Education Press, <Physical Chemistry> Han Degang, Higher Education Press "Physical Chemistry" (6th edition) Atkins	Including thermodynamics, fundamentals of chemical kinetics, electrochemistry. The main content of thermodynamics is equilibrium thermodynamics, with a brief introduction of the non equilibrium thermodynamics. It also includes the principles of thermodynamics, chemical equilibrium, phase equilibrium, etc.. Chemical kinetics introduces the rate theory, the typical mechanism of complex reaction, reaction order and so on; electrochemistry focuses on reversible electrode potential, electromotive force calculation and their applications. There are also some introduction to the phenomenon of interface and molecular self-assembly.
Organic Chemistry	112 class hours, two semesters	closed book examination	<Fundamentals of Organic Chemistry>, Xing Qiyi <Organic Chemistry>, 7 edition (2001), Graham Solomons, et al , John Wiley & Sons, Inc	Introduction of the nomenclature of organic compounds, structure, physical properties, reaction and application. Introducing the electronic effect and steric effect on the organic compounds and studying the relationship between the structure and chemical properties. And also outlining the stereochemistry, the spectrum of the organic structure,, the mechanisms of organic reactions, and natural products and so on.
Inorganic Chemistry	112 class hours, two semesters	closed book examination	<Inorganic Chemistry> (Third Edition), Wuhan University and other schools series, Higher Education Press	Including the general principles of chemical reaction, physical structure and knowledge of chemical elements, the basic content of chemical analysis. Training students to understand and resolve some problems of the inorganic chemistry and chemical analysis for professional and real life.
Analytical	32 class	closed book	<Analytical Chemistry> (Second Edition), Xue	This course is mainly to quantitative analysis, focusing on acid-base and

Chemistry	hours, one semester	examination	Hua, Tsinghua University Press, 1994	complexometric titration. Explain the basic theory of analytical chemistry reaction and cope with the problems of complex equilibrium system using the side reaction coefficient. Introducing errors and data processing, acid-base titration, complexometric titration, redox titration, precipitation titration, potentiometric titration, spectrophotometer, the separation and concentration methods.
Instrumental Analysis Chemistry	48 class hours, one semester	closed book examination	<Modern Instrumental Analysis Experiment and Technology>, Tsinghua University Press, 2006	This course is mainly to introduce the electrochemical analysis, atomic spectroscopy, molecular spectroscopy, nuclear magnetic resonance spectroscopy, chromatography, mass spectrometry, surface and interface analysis, and other modern instrumental analysis methods.
Structural Chemistry	64 class hours, one semester	Closed book examination	<Fundamentals of Structural Chemistry>, Zhou gongdu, Duan Lianyun, Peking University Press	Including the quantum mechanics, molecular symmetry, group theory, atomic structure, structure of diatomic molecule, and multi-atom molecular structure, the valence bond Theory, the molecular orbital theory, the ligand field theory, the variational method, the Hückel molecular orbital method.
General Biology	64 class hours, one semester	Closed book examination	<General biology> Chen Zengyue, Higher Education Press, 1997	This course focuses on the universal law of life sciences, basic knowledge, basic principles and development trends. It includes preliminary knowledge of Cytology, molecular genetics and biological evolution, phytobiology, animal biology, biological groups, and environ biology.
Fundamentals of Chemical Engineering	64 class hours, one semester	Closed book examination and experiment	<Fundamentals of Chemical Engineering>, Lin Aiguang series, Tsinghua University Press, 1st Edition <Principle of Chemical Engineering>, Jiang Weijun, Cambridge University Press , 2003	This course is all about the fundamental knowledge of the chemical engineering, including flow and transport of fluid, two-phase flow, heat-transfer process, absorption process, distillation and gas-liquid mass transfer equipment. There are wide ranges of knowledge, both theoretical and practical.
Organic Electronics	32 class hours, one semester	Thesis and seminar	< Electronic processes in organic crystals>, Martin Pope, Charles, E. Swenberg. Clarendon Press, Oxford, Oxford Univ. Press. New YorK, 1982.	Organic electronics is a cross-chemical, electronics, materials, cross-disciplinary subjects. The course of organic electronics in the set of basic concepts, principles, while introducing organic conductive materials, organic semiconductor materials, Organic superconducting materials in organic light-emitting diodes, organic thin film transistors, organic solar cells and other applications
Green	32 class	Thesis,	Chang-Wei Hu, Xian-Jun, <the principles and	The course gives students the concept of green chemistry, theories,

Chemistry	hours, one semester	examination and seminar	applications of green chemistry>, China Petrochemical Press, 2002	principles and tasks. At the same time, it introduces the green chemistry method and its application, including catalytic reactions and atom economic reaction, green materials, green solvent, and the design and production of the green chemistry product.
Spectral Identification of Organic Compounds	48 class hours, one semester	Examination and seminar	Ningyong Cheng, <Identification of organic compounds and organic spectroscopy>, Science Press R. M. Silverstein, et al.,<Spectrometric Identification of Organic Compounds>, John Wiley & Sons	Through classes, learning, discussion and presentations, students study the basic principles and latest developments of the nuclear magnetic resonance spectroscopy (NMR, carbon NMR spectrum and two-dimensional NMR), mass spectrometry and infrared spectra. And they will master the skills of identify organic compounds by several ways and then solve the practical problems they meet in their own researches.
Biological Physics Frontier	48 class hours, one semester	Homework, seminar and thesis	Zhao Nanming, Zhou Haimeng. <Biophysics> , Higher Education Press	Describes the forefront of the field of biological physics research, including structural biology, membrane biophysics, molecular biophysics and computational biology.
Theoretical and Computational Chemistry	64 class hours, one semester	Close book examination	[1] The Basics of Theoretical and Computational Chemistry，Bernd Michael Rode, Thomas S. Hofer, Michael D. Kugler, Wiley, 2007. [2] Introduction to Computational Chemistry, 2nd Edition, by Frank Jensen, Wiley, 2006.	Basics of quantum chemistry, molecular orbital theory, ab initio theory, density functional theory, computational spectroscopy, computational material chemistry, molecular simulations.

Main experiment course

Course name	syllabus
General Biological Experiment	This course contains the most classic experiments in plant biology and animal biology. It is base on observation and anatomical experiments, combined with some physiology experiments. There are some basic experiments, such as the use of the microscope, the extraction and separation of the chlorophyll from leaves. We carry out a series of experiments to study the structure and function of the plant roots, stems, leaves, and also the structure of plant reproductive organs. In addition, we have performed the toad's anatomy, the anatomy of rabbit.
Organic Chemistry Experiments	This experiment course aims to train students to master the basic skills of performing organic chemistry experiment. Students will learn many basic experimental operations, such as distillation, fractionation, sublimation, extraction, drying, and recrystalization. Besides, in order to know the quality, students need to determine the physical constants, like melting point, boiling point, refractive index, and etc., of the organic compounds after they synthesize them. Finally, every student will design a synthetic route to finish an organic synthesis by themselves.
Inorganic Chemistry Experiments	By finishing the inorganic chemistry experiments course, students will master the basic experiment skills and basic theory of experiments. This course provides students chance to perform the preparation and purification of inorganic compounds, and also the chance to use the analytical balance, pH meters. Besides, students will learn to determine the chemical reaction rate and the electrode potential. They will also carry out the preparation of the ferrous ammonium sulfate as a Comprehensive Experiment. Some experiments need student to use computer processing the experimental data. In addition, students who finish this course are required to have the ability to analyze the common elements and compounds, for example, the P zone metal elements: chromium and manganese, iron, cobalt, nickel.
Analytical Chemistry Experiment	Through this experimental program, students receive training in the following aspects: 1. Specification of basic operations: the use and washing methods of buret, volumetric flask, pipette and other commonly used glass containers; the preparation of solution; the standard operation of weighing the sample; sample dissolution, etc.). 2. Proper operation of equipment (including the analytical balance, pH meter, spectrophotometer, etc.); 3. Master the ability of the acid-base titration, complexometric titration, redox titration, gravimetry, spectrophotometry, ion exchange methond and other typical methods of analysis; 4. Accurately record of the original experimental data, write experiment reports, calculate the experimental error and understand the importance of the precision and accuracy in analytical chemistry experiment.
Physical Chemistry Experiment	This experiment course aims to teach students to determine the important parameters and their variation during the chemical reaction and the related physical changing process. At the same time, it gives students general concepts of those principles, methods, and techniques. All the experiments are related to electrochemistry, chemical kinetics, surface and colloid chemistry.
Instrumental Analysis Experiment	Students will learn to use modern instrument to qualitative and quantitative analyze the organic and inorganic compounds, for instance, structure analysis of organic compounds. All the apparatus include infrared, ultraviolet spectrophotometer, atomic absorption spectrometry, atomic emission spectrometry, chromatography, mass spectrometry, nuclear magnetic resonance.