

CHEM-CHEMISTRY

CHEM 1305 Fundamentals of General Chemistry 5 Credit Hours

Prerequisite: MATH 1503 or MATH 1643 or a Math ACT score of 23 or higher. This course covers topics from both semesters of the traditional general chemistry series and is geared towards students who need only one semester of general chemistry. Topics to be covered may range from biochemistry, inorganic, organic, and environmental chemistry. Not open to students with credit for CHEM 1315, CHEM 1335, CHEM 1415, or CHEM 1435. (F) [II-NSL].

CHEM 1315 General Chemistry 5 Credit Hours

Prerequisite: MATH 1503 or MATH 1643, or Math ACT equal to or greater than 25. General Chemistry is an overview of the chemical basis of natural phenomena. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, atomic theory, electron configuration, periodicity, chemical reactivity and energetics, stoichiometry, gas laws and changes in state, bonding and molecular structure. A student may not receive credit for this course and CHEM 1335. Laboratory. (F, Sp, Su) [II-NSL].

CHEM 1335 General Chemistry I: Signature Course 5 Credit Hours

Prerequisite: MATH 1503 or MATH 1643, or Math ACT equal to or greater than 25 AND 2 years high school chemistry OR AP Chemistry. General Chemistry is an overview of the chemical basis of natural phenomena. First of a two-semester sequence which prepares students for higher-level courses and research. Topics include atomic and molecular structure, chemical reactions, basic thermodynamics, properties of gases, liquids, solids and solutions, including select stoichiometric and quantitative analysis. A student may not receive credit for this course and CHEM 1315. (F, Sp) [II-NSL].

CHEM 1415 General Chemistry (Continued) 5 Credit Hours

Prerequisite: CHEM 1305 with a minimum grade of B or CHEM 1315 with a minimum grade of C or CHEM 1335 with a minimum grade of C or a satisfactory score on the chemistry placement examination. Topics covered include thermochemistry, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry. A student may not receive credit for this course and CHEM 1435. Laboratory. (F, Sp, Su) [II-NSL].

CHEM 1425 Advanced General Chemistry (HONORS) 5 Credit Hours

Prerequisite: Admission to Honors Program; STEM major and four years of high school math and 1 year high school chemistry, or permission of instructor. Designed for STEM majors well prepared in high school chemistry and math. Topics covered at an advanced level of understanding. The topics include: nature of solutions, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry, gas laws and changes in state, molecular structure. Laboratory. (F) [II-NSL].

CHEM 1435 General Chemistry II: Signature Course 5 Credit Hours

Prerequisite: grade of C or better in CHEM 1315 or CHEM 1335 or satisfactory score on the chemistry placement examination. General Chemistry is an overview of the chemical basis of natural phenomena. Second of a two-semester sequence which prepares students for higher-level courses and research. Topics include chemical kinetics and thermodynamics including calorimetry, equilibria, electrochemistry, nuclear chemistry, ionic salts, properties of acids and bases, and acid-base reactions including buffers. Students may not receive credit for 1435 and 1415. Laboratory. (F, Sp) [II-NSL].

CHEM 2970 Special Topics/Seminar 1-3 Credit Hours

Special Topics. 1 to 3 hours. May be repeated; Maximum credit nine hours. Special topics course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research, and field projects. (Irreg.)

CHEM 3005 Quantitative Analysis 5 Credit Hours

Prerequisite: CHEM 1415 or CHEM 1425 or CHEM 1435 or equivalent. Analysis by quantitative procedures. Laboratory. (F, Sp)

CHEM 3053 Organic Chemistry I: Biological Emphasis 3 Credit Hours

Prerequisite: CHEM 1415 or CHEM 1425 or CHEM 1435. Intended for life science majors. First course in a two-semester sequence (3053 and 3153). This course will cover the concepts of organic structure, nomenclature, and reactivity with an emphasis on biological applications. (F, Sp, Su)

CHEM 3064 Organic Chemistry I 4 Credit Hours

Prerequisite: CHEM 1415 or CHEM 1425 or CHEM 1435. Intended for chemistry and biochemistry majors. First course in a two-semester sequence (3064 and 3164). This course will cover the concepts of organic structure, nomenclature, reactivity, and synthesis. The laboratory will use selected experiments to develop the fundamental techniques used in organic research including utilization of spectroscopy and to demonstrate the application of the scientific approach to laboratory work. Laboratory. (F)

CHEM 3152 Organic Chemistry Laboratory: Biological Emphasis 2 Credit Hours

Prerequisite: CHEM 3053 or concurrent enrollment. Intended for life science majors. Laboratory course designed to accompany CHEM 3053 and CHEM 3153. Selected experiments designed to illustrate the fundamental techniques used in organic chemistry, to develop familiarity with the properties of organic compounds and to introduce analytical techniques including spectroscopy. (F, Sp, Su)

CHEM 3153 Organic Chemistry II: Biological Emphasis 3 Credit Hours

Prerequisite: CHEM 3053 with a grade of C or better. Intended for life science majors. Second course in a two-semester sequence (3053 and 3153). This course will cover the concepts of organic chemical reactivity with an emphasis on carbohydrates, lipids, and proteins. (F, Sp, Su)

CHEM 3164 Organic Chemistry II 4 Credit Hours

Prerequisite: CHEM 3064, or both CHEM 3053 and CHEM 3152; with a grade of C or better. Intended for chemistry and biochemistry majors. Second course in a two-semester sequence (3064 and 3164). This course will continue the development of organic chemical reactivity, with an emphasis on synthesis, polymers, and biomolecules. The laboratory will use selected experiments to continue the development of techniques used in organic research with an emphasis on synthesis. Laboratory (Sp)

CHEM 3421 Physical Chemistry Laboratory 1 Credit Hour

Prerequisite: 3423 or concurrent enrollment. Physicochemical measurements and calculations. (F, Sp, Su)

CHEM 3423 Physical Chemistry I 3 Credit Hours

Prerequisite: CHEM 1415 or CHEM 1425 or CHEM 1435; MATH 2423 or MATH 2924 or concurrent enrollment. Kinetic theory of ideal gases and properties of real gases; first, second, and third laws of thermodynamics; chemical and phase equilibria; and chemical kinetics and reaction mechanisms. (F, Sp, Su)

- CHEM 3440 Mentored Research Experience 3 Credit Hours**
0 to 3 hours. Prerequisites: ENGL 1113 or equivalent, and permission of instructor. May be repeated; maximum credit 12 hours. For the inquisitive student to apply the scholarly processes of the discipline to a research or creative project under the mentorship of a faculty member. Student and instructor should complete an Undergraduate Research & Creative Projects (URCP) Mentoring Agreement and file it with the URCP office. Not for honors credit. (F, Sp, Su)
- CHEM 3451 Basic Physical Chemistry Laboratory 1 Credit Hour**
Prerequisite: 3453 or concurrent enrollment. Laboratory application of physical chemical principles and techniques. (F, Sp)
- CHEM 3453 Basic Physical Chemistry 3 Credit Hours**
Prerequisite: CHEM 1415 or CHEM 1425 or CHEM 1435; MATH 1823 or MATH 1914; PHYS 2424 or PHYS 2524. The application of physical chemical principles and methods. (F, Sp)
- CHEM 3521 Physical Chemistry Laboratory 1 Credit Hour**
Prerequisite: CHEM 3523 or concurrent enrollment and CHEM 3421 with a grade of C or better. To perform experiments which illustrate important principles in physical chemistry. (F, Sp, Su)
- CHEM 3523 Physical Chemistry II 3 Credit Hours**
Prerequisite: 3423 with a grade of "C" or above. Continuation of 3423. Kinetics, electrochemistry, atomic and molecular states of matter, etc. (F, Sp)
- CHEM 3653 Introduction to Biochemistry 3 Credit Hours**
Prerequisite: CHEM 3013, CHEM 3053, or CHEM 3064, with a grade of C or better. Chemistry of proteins, carbohydrates, lipids, and nucleic acids; enzyme kinetics; biochemical energetics; intermediary metabolism; regulatory processes. A Student may not receive credit for this course and CHEM 3853. (F)
- CHEM 3753 Introduction to Biochemical Methods 3 Credit Hours**
Prerequisite: CHEM 3653 or CHEM 3853 or concurrent enrollment. A survey of current and routinely used methods in biochemistry. Students attend lecture twice weekly and a three-hour lab per week. Laboratory (Sp)
- CHEM 3853 Biochemistry I 3 Credit Hours**
Prerequisite: CHEM 3153 or CHEM 3164 with a grade of C or better. Course 1 of a 2 course progression with focus on Biochemistry. Provides an overview of the cell as an elaborate chemical reactor. Serves as a foundation for further in-depth studies of cellular metabolism. Topics include: structure and function of major biomolecules, catalysis, energy generation, biosynthesis, and information processing. A student may not receive credit for this course and CHEM 3653. (F)
- CHEM 3953 Biochemistry II 3 Credit Hours**
Prerequisite: CHEM 3853 with a grade of C or better, or CHEM 3653 with a grade of B or better. Course 2 of a 2 course progression with focus on Biochemistry. Topics include information metabolism, biochemical aspects of cell organization, and primary molecular biology reactions. Special emphasis on inhibition of various pathways and drug design and discovery. (Sp)
- CHEM 3960 Honors Reading 1-3 Credit Hours**
1 to 3 hours. Prerequisite: permission of instructor and permission of Honors College. May be repeated; maximum credit six hours. Consists of topics designated by the instructor in keeping with the student's major program. The topics will cover materials not usually presented in the regular courses. (F, Sp, Su)
- CHEM 3970 Honors Seminar 1-3 Credit Hours**
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. The projects covered in this course will vary. The content will deal with concepts not usually presented in regular coursework. (Irreg.)
- CHEM 3980 Honors Research 1-3 Credit Hours**
1 to 3 hours. Prerequisite: permission of instructor and permission of Honors College. May be repeated; maximum credit six hours. Provides an opportunity for the gifted Honors candidate to work at a special project in the student's field. (F, Sp, Su)
- CHEM 3990 Independent Study 1-3 Credit Hours**
1 to 3 hours. Prerequisite: permission of instructor. May be repeated; maximum credit six hours. Contracted independent study for topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (F, Sp, Su)
- CHEM 4023 Instrumental Methods of Chemical Analysis 3 Credit Hours**
Prerequisite: CHEM 3005. Introduction to instrumental methods of analysis, with emphasis upon electrometric and spectroscopic techniques and instruments. Includes sampling procedures, requirements of reagents and standards, and evaluation of errors. (F)
- CHEM 4033 Instrumental Methods of Chemical Analysis Laboratory 3 Credit Hours**
Prerequisite: 4023. Selected experiments illustrating the principles developed in 4023. Two four and a half hour laboratories per week. Laboratory (Sp)
- CHEM 4053 Culinary Chemistry and Culture in Italy 3 Credit Hours**
Prerequisite: CHEM 1415 or CHEM 1435 with a grade of C or better. The overall objectives are to understand the chemicals in major chemical processes that occur in the production of wine, cheese, pasta, and gelato and the importance of the traditional meal in Italian culture and knowledge of the varieties of wine and cheese in Italy, making direct and integrated connections between the Organic Chemistry covered in and outside of the classroom. (Su)
- CHEM 4232 Laboratory Glassblowing 2 Credit Hours**
Prerequisite: Departmental permission. Discussion of materials and techniques with demonstrations of procedures. Exercises will be performed in the laboratory with a special emphasis upon the different types of seals required in the construction of glass apparatus. One hour of lecture and three hours of laboratory will be scheduled each week. (F, Sp)
- CHEM 4333 Advanced Inorganic Chemistry-Periodic System 3 Credit Hours**
Prerequisite: CHEM 3053 or CHEM 3064. A survey of all elements and important compounds based on atomic structure and position in the Periodic System; effect of atomic size, ionic size and charge on the properties of elements. Inorganic nomenclature. (F)
- CHEM 4444 Advanced Synthesis and Spectral Characterization 4 Credit Hours**
Prerequisite: CHEM 3164, or both CHEM 3152 and CHEM 3153. Lectures cover spectroscopic analysis, thermodynamics of synthesis and fundamentals of advanced techniques, and hands-on spectroscopic identification of reaction products. Two lecture and six laboratory hours per week. Laboratory (Sp)

- CHEM 4753 Principles of Biochemistry I** 3 Credit Hours
Prerequisite: CHEM 3153 or CHEM 3164, CHEM 3423 or CHEM 3453, CHEM 3653 or CHEM 3853 or equivalent. The first semester of a two-semester sequence covering the fundamental principles of protein structure and function, enzymology, carbohydrate and lipid metabolism, biochemical energetics, membranes, nucleic acid and protein metabolism, information transfer and the genetic code, and the interdependence of biochemical pathways. (F)
- CHEM 4913 Senior Thesis** 3 Credit Hours
Prerequisite: permission of instructor and permission of department. Capstone Course. Research project, theoretical or experimental, to be arranged with individual faculty member, leading to a senior thesis. Each student will present an oral report in a lecture presentation or poster format to an audience of students and faculty. Laboratory (F, Sp) [V].
- CHEM 4923 Senior Project** 3 Credit Hours
Prerequisite: Permission of instructor and permission of department. Capstone Course. Topics of current interest and importance in chemistry or biochemistry, requiring in-depth reading, extensive literature search, group work, and report writing. (F, Sp) [V].
- CHEM 4933 Current Topics in Biochemistry** 3 Credit Hours
Prerequisite: Either CHEM 3653 or CHEM 3853; CHEM 3753; and one semester of physical chemistry with lab. Capstone course for biochemistry majors. Topics of current interest in biochemistry. Students will attend lectures and will be involved in literature search, group discussion, oral presentation, and report writing. (Sp) [V].
- CHEM 4960 Directed Readings** 1-4 Credit Hours
1 to 4 hours. Prerequisite: good standing in University; permission of instructor and dean. May be repeated; maximum credit four hours. Designed for upper-division students who need opportunity to study a specific problem in greater depth than formal course content permits. (Irreg.)
- CHEM 4970 Special Topics/Seminar** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Senior standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)
- CHEM 4980 Undergraduate Research** 1-4 Credit Hours
Prerequisite: permission of instructor. May be repeated; maximum credit six hours. Provides an opportunity for student to work on a special project under the supervision of faculty in the student's field. (F, Sp, Su)
- CHEM 4990 Independent Study** 1-3 Credit Hours
1 to 3 hours. Prerequisite: permission of instructor. May be repeated; maximum credit six hours. Contracted independent study for topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (F, Sp, Su)
- CHEM 5001 Practicum in General Chemistry Education** 1 Credit Hour
Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. Explores the pedagogical issues associated with teaching general chemistry at the undergraduate level. Includes administration of instruction, student and teacher behavior, goals of instruction, instructional strategies, student thinking processes, problem solving, and grading. (F)
- CHEM 5011 Fundamentals I** 1 Credit Hour
Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. Designed to provide all students entering the graduate program with the skills required to succeed in the Ph.D. program. (F)
- CHEM 5021 Fundamentals II** 1 Credit Hour
Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. Designed to provide all first-year graduate students with the skills required to succeed in the Ph.D. program. (Sp)
- CHEM 5080 Laboratory Rotations** 1-2 Credit Hours
1 to 2 hours. Prerequisite: graduate standing in the Department of Chemistry and Biochemistry. May be repeated; maximum credit 3 hours. Seven-week rotations per credit hour in research laboratories, normally during the first semester of graduate school. (F, Sp)
- CHEM 5090 Departmental Colloquium** 0 Credit Hours
Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. Enrollment is expected during each semester of graduate study. Oral presentations on recent developments in chemistry and biochemistry by invited speakers, faculty, advanced graduate students, and postdoctoral fellows. (F, Sp)
- CHEM 5100 Instrumental Methods of Analysis** 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Core course for the Analytical Program. Topics will provide an overview of various instrumental methods employed for qualitative and quantitative chemical analysis. (F, Sp)
- CHEM 5110 Spectroscopic Chemical Analysis** 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Core course for the Analytical Program. Theory and operation of instruments employed for optical spectroscopy. (F, Sp)
- CHEM 5120 Separation Methods** 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Core course for the Analytical Program. Basic principles underlying methods employed for chemical separations with emphasis on chromatographic methods. (F, Sp)
- CHEM 5160 Special Topics in Analytical Chemistry: Instrumentation** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5100, or permission of instructor. May be repeated with change of content; maximum credit 12 hours. Selected topics will focus on instrumentation and applications of selected chemical analysis techniques. (Irreg.)
- CHEM 5170 Special Topics in Analytical Chemistry: Methodology** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5100, or permission of the instructor. May be repeated with change in subject matter for a maximum of 12 credit hours. Selected topics will focus on details of specific methodologies employed for chemical analysis. (Irreg.)
- CHEM 5180 Practicum in Analytical Chemistry** 1-2 Credit Hours
1 to 2 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5100, or permission of the instructor. May be repeated with change of content; maximum credit four hours. Study and training in practical methods relevant to analytical chemistry. (F, Sp)

- CHEM 5191 Seminar in Analytical Chemistry 1 Credit Hour**
Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated; maximum credit 12 hours. Oral presentations and discussions of topics relevant to the current state-of-the-art in analytical chemistry research. (F, Sp)
- CHEM 5200 Principles of Biochemistry 1-3 Credit Hours**
1 to 3 hours. Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Core course for graduate Biochemistry Program. Fundamental principles of biomolecules, protein structure and function, enzymology, carbohydrate and lipid metabolism, nucleic acid and protein metabolism, membranes and signal transduction, expression and transmission of genetic information, and the interdependence of biochemical pathways. (F, Sp)
- CHEM 5210 Molecular Biology 1-3 Credit Hours**
1 to 3 hours. Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Core course for graduate Biochemistry Program. Characteristics and biological functions of nucleic acids and proteins in living cells with emphasis on nucleic acid replication, transcription, translation and regulation; also emphasis on the molecular aspects of genetic engineering/recombinant DNA technology. (F, Sp)
- CHEM 5240 Biochemical and Biophysical Methods 1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5200, or permission of the instructor. Basic principles and practical applications of the analytical and preparative techniques used in current biochemical and biophysical research. (F, Sp)
- CHEM 5260 Special Topics in Biochemistry I 1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5240, or permission of the instructor. May be repeated with change of content; maximum credit 12 hours. Selected contemporary topics that investigate the frontiers of knowledge in biochemistry. (Irreg.)
- CHEM 5270 Special Topics in Biochemistry II 1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5240, or permission of the instructor. May be repeated with change of content; maximum credit 12 hours. Selected contemporary topics that focus on applications of biochemical knowledge. (Irreg.)
- CHEM 5280 Practicum in Biochemistry 1-2 Credit Hours**
1 to 2 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5240, or permission of the instructor. May be repeated with change of content; maximum credit four hours. Study and training in practical methods relevant to biochemistry. (F, Sp)
- CHEM 5291 Seminar in Biochemistry 1 Credit Hour**
Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated; maximum credit 12 hours. Research seminar in which graduate students and invited speakers present and discuss current advances in biochemical research. (F, Sp)
- CHEM 5300 Intermediate Inorganic Chemistry 1-3 Credit Hours**
1 to 3 hours. Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Fundamental concepts and an introduction to modern inorganic chemistry. Topics may include: atomic structure and relation to properties of the elements, bonding theory, coordination and bioinorganic compounds, organometallic compounds and catalysis, symmetry and applications to spectroscopy, magnetic materials. (F, Sp)
- CHEM 5330 Advanced Inorganic Chemistry 1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5300, or permission of instructor. May be repeated with change of content; maximum credit 12 hours. For students majoring in inorganic chemistry. Selected topics for this course may include: physical and experimental methods in inorganic chemistry, modern spectroscopic methods in inorganic chemistry, bioinorganic and organometallic reactions, advanced kinetics and inorganic reaction mechanisms, catalysis, and advanced experimental design for mechanistic evaluation. (F, Sp)
- CHEM 5360 Frontiers in Inorganic Chemistry 1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5300, or permission of instructor. May be repeated with change of content; maximum credit 12 hours. Selected topics concerning the theory, synthesis, reactivity and applications of inorganic and coordination compounds. Topics may include: computational chemistry, electrochemistry, metals in biology and medicine, industrial and biological main group chemistry, environmental chemistry, applications of inorganic compounds in alternative energy (nuclear cycle, hydrogen cycle, photovoltaics), and inorganic materials science (metal-organic frameworks, metallopolymers, inorganic polymers). (F, Sp)
- CHEM 5380 Practicum in Inorganic Chemistry 1-2 Credit Hours**
1 to 2 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5300, or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Study and training in practical methods relevant to inorganic chemistry. (F, Sp)
- CHEM 5391 Seminar in Inorganic Chemistry 1 Credit Hour**
Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5300, or permission of instructor. May be repeated; maximum credit 12 hours. Graduate student research seminar and related activities, with a selection of topics related to research preparation and research outcomes. (F, Sp)
- CHEM 5400 Organic Chemistry I: Mechanisms and Reactivity 1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Core course for graduate Program of Study in Organic Chemistry. Introduction to the study of organic reaction mechanisms and reactivity. (F, Sp)
- CHEM 5430 Organic Chemistry II: Reactions and Synthesis 1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5400, or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Core course for graduate Program of Study in Organic Chemistry. Detailed treatment of reactions used in organic synthesis and the design of synthetic strategy. (F, Sp)

- CHEM 5450 Structural Characterization of Organic Compounds** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5400, or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Application of current methods to problems of structure determination in organic chemistry. (F, Sp)
- CHEM 5460 Special Topics in Chemical Reactivity and Physical Organic Chemistry** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5400, or permission of instructor. May be repeated with change of content; maximum credit 12 hours. Selected topics in the study and application of specialized chemical reaction methods. Topics may include: theoretical or computational aspects of organic chemistry; advanced study of reaction mechanisms; study and application of novel chemical methods such as photochemical methods, organometallic chemistry, chemical catalysis, reagent design and application. (Irreg.)
- CHEM 5470 Special Topics in Bioorganic and Specialized Organic Compounds** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5400, or permission of instructor. May be repeated with change of content; maximum credit 12 hours. Selected topics in the study and preparation of specialized classes of organic compounds including biologically related aspects of organic chemistry. Topics may include: specialized synthesis and design strategies; medicinal chemistry; study and application of biosynthetic methods; advanced synthetic design for targeted organic compounds; study of specialized classes of compounds including natural products, medicinal compounds, bioactive compounds, polymers, functional materials and devices. (Irreg.)
- CHEM 5480 Practicum in Organic Chemistry** 1-2 Credit Hours
1 to 2 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5400, or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Study and training in practical methods relevant to organic chemistry. Topics may include: use of modern instrumental methods for organic structural determination; acquisition and interpretation of spectral data for structural determination; optimization of measurement techniques; specialized preparative laboratory methods; specialized methods for separation and analysis of organic compounds. (F, Sp)
- CHEM 5491 Seminar in Organic Chemistry** 1 Credit Hour
Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5400, or permission of instructor. May be repeated; maximum credit 12 hours. Research and literature seminar for presenting and discussing a selection of topics from current literature or research in organic chemistry. (F, Sp)
- CHEM 5500 Topics in Quantum Chemistry** 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing in the Department of Chemistry and Biochemistry or permission of instructor. May be repeated with change of content; maximum credit 6 hours. Review of classical mechanics; introduction to wave mechanics and applications to atoms and molecules. This is a core course for graduate majors. (F, Sp)
- CHEM 5530 Topics in Statistical Thermodynamics** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5500 or concurrent enrollment, or permission of the instructor. May be repeated with change of content; maximum credit 6 hours. Chemical thermodynamics, statistical thermodynamics, chemical kinetics, applications of quantum chemistry, structure of matter. This is a core course for graduate majors. (F, Sp)
- CHEM 5570 Selected Topics in Physical Chemistry** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5500 or CHEM 5520, or permission of instructor. May be repeated with change of content; maximum credit 12 hours. Studies in special areas of physical chemistry not covered in the regular course curriculum. (F, Sp)
- CHEM 5580 Practicum in Physical Chemistry** 1-2 Credit Hours
1 to 2 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5500 or CHEM 5520, or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Study and training in practical methods relevant to physical chemistry. (F, Sp)
- CHEM 5591 Seminar in Physical Chemistry** 1 Credit Hour
Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5500 or CHEM 5520, or permission of instructor. May be repeated; maximum credit 12 hours. Participation is required of all graduate students majoring in physical chemistry. Research seminar, with a selection of topics from current or projected research at the University of Oklahoma. Discussion of contemporary topics in physical chemistry and related disciplines. (F, Sp)
- CHEM 5730 Macromolecular Crystallography** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5210, or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Principles of diffraction, symmetry, reciprocal space, data collection, data reduction and absorption corrections; methods for structure solution and refinement; and interpretation of data and limitations thereof. (F, Sp)
- CHEM 5750 Macromolecular Structure and Function** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5200, or permission of instructor. May be repeated with change of content; maximum credit 4 hours. Principles of protein architecture and levels of organization, nucleic acid structure, functional roles of intermolecular interactions, structure-function in protein and nucleic acid complexes. (F, Sp)
- CHEM 5760 Special Topics in Structural Biology** 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5200, or permission of instructor. May be repeated with change of content; maximum credit 12 hours. Content may include the structural basis of signal transduction, structural dynamics, computational methods for biological macromolecules, microscopy, structural basis for gene regulation, and structure-guided drug discovery and design. (Irreg.)

CHEM 5780 Practicum in Structural Biology 1-2 Credit Hours

1 to 2 hours. Prerequisite: Graduate standing in the Department of Chemistry and Biochemistry and CHEM 5730 or CHEM 5740, or permission of instructor. May be repeated; maximum credit four hours. The X-ray practicum (prerequisite: 5730) includes crystallization, advanced checkout and operation of X-ray diffractometers, data collection using research samples, structure solution and refinement, and evaluation of crystal structure quality. The NMR practicum (prerequisite: 5740) includes sample preparation of biological macromolecule on a research sample, advanced checkout and operation of NMR spectrometers, structure determination and dynamics, and evaluation of structure quality. (F, Sp)

CHEM 5960 Directed Readings in Chemistry 1-2 Credit Hours

1 to 2 hours. Prerequisite: permission. May be repeated with change of content; maximum credit six hours. Selected from topics of current interest in any of the areas of chemistry. (F, Sp, Su)

CHEM 5970 Special Topics/Seminar 1-3 Credit Hours

1 to 3 hours. Prerequisite: Graduate standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)

CHEM 5980 Research for Master's Thesis 2-9 Credit Hours

Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. (F, Sp, Su)

CHEM 5990 Independent Studies 1-3 Credit Hours

1 to 3 hours. May be repeated with change of subject matter; maximum credit nine hours. Staff members in the student's field of interest supervise research and/or library studies which closes gaps in student's training or builds on this training in specialized areas. (F, Sp, Su)

CHEM 6960 Directed Readings 1-3 Credit Hours

1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit six hours. Directed readings and/or literature review under the direction of a faculty member. (Irreg.)

CHEM 6980 Research for Doctoral Dissertation 2-16 Credit Hours

2 to 16 hours. Prerequisite: Graduate standing; may be repeated. Directed research culminating in the completion of the doctoral dissertation. (F, Sp, Su)

CHEM 6990 Independent Study 1-3 Credit Hours

1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)