Chemistry

CHEM 1111 (CHEM 1111) General Chemistry Laboratory I (1 semester credit hour) Introduction to the chemistry laboratory. Experiments are designed to demonstrate concepts covered in CHEM 1311; including properties and reactions of inorganic substances and elementary qualitative and quantitative analysis. Course online access fees of up to $150 may be charged for this course. Please see the course's syllabi in CourseBook for more details. Lab fee of $30 required. Corequisite: CHEM 1311. (0-3) S

CHEM 1112 (CHEM 1112) General Chemistry Laboratory II (1 semester credit hour) A continuation of CHEM 1111 demonstrating the concepts covered in CHEM 1312, including acid-base chemistry, reaction kinetics, electrochemistry, polymers, and organic synthesis. Course online access fees of up to $150 may be charged for this course. Please see the course's syllabi in CourseBook for more details. Lab fee of $30 required. Prerequisite: CHEM 1111 or CHEM 1115. Corequisite: CHEM 1312. (0-3) S

CHEM 1115 Honors Freshman Chemistry Laboratory I (1 semester credit hour) This course and its follow-on (CHEM 1116) reinforce the concepts of Freshman Chemistry via experiments. Students are offered the opportunity to acquire basic laboratory skills and an appreciation for the presence of chemistry in daily living through a combination of laboratory and computer experiments and applied research modules. Lab fee of $30 required. Corequisite: CHEM 1315. (0-3) Y

CHEM 1116 Honors Freshman Chemistry Laboratory II (1 semester credit hour) A continuation of CHEM 1115. This course reinforces concepts presented in CHEM 1316. Lab fee of $30 required. Prerequisite: CHEM 1115. Corequisite: CHEM 1316. (0-3) Y

CHEM 1301 General Chemistry for Engineers (3 semester credit hours) Covers fundamental concepts and selected material developed in a traditional two-semester General Chemistry lecture sequence (CHEM 1311 and CHEM 1312), with a focus on those important for Engineering students. May not be used to fulfill degree requirements for pre-health majors. Students will also be registered for the exam section. Department consent required. (3-0) S

CHEM 1311 (CHEM 1311) General Chemistry I (3 semester credit hours) Introduction to elementary concepts of chemistry theory. The course emphasizes chemical reactions, the mole concept and its applications, and molecular structure and bonding. Students will also be registered for the exam section. Course online access fees of up to $150 may be charged for this course. Please see the course's syllabi in CourseBook for more details. Corequisite: CHEM 1111. (3-0) S

CHEM 1312 (CHEM 1312) General Chemistry II (3 semester credit hours) A continuation of CHEM 1311 treating metals; solids, liquids, and intermolecular forces; chemical equilibrium; electrochemistry; organic chemistry; rates of reactions; and environmental, polymer, nuclear, and biochemistry. Students will also be registered for the exam section. Course online access fees of up to $150 may be charged for this course. Please see the course's syllabi in CourseBook for more details. Prerequisite: CHEM 1311 or CHEM 1315. Corequisite: CHEM 1112. (3-0) S

CHEM 1315 Honors Freshman Chemistry I (3 semester credit hours) An advanced course dealing with the principles of structure and bonding and the physical laws that govern the interactions of molecules. The course is intended for students who have a solid background in chemistry at the secondary level and the desire to explore general chemistry concepts more deeply. Corequisite: CHEM 1115. (3-0) Y

CHEM 1316 Honors Freshman Chemistry II (3 semester credit hours) A continuation of the presentation of concepts begun in CHEM 1315. This course will present advanced topics including those in organic, biochemistry, and environmental chemistry. Prerequisite: CHEM 1315 or instructor consent required. Corequisite: CHEM 1116. (3-0) Y

CHEM 2123 (CHEM 2123) Introductory Organic Chemistry Laboratory I (1 semester credit hour) The experimental skills associated with organic functional group reactions. Lab fee of $30 required. Corequisite: CHEM 2323. (0-4) S

CHEM 2125 (CHEM 2125) Introductory Organic Chemistry Laboratory II (1 semester credit hour) Continuation of Introductory Organic Chemistry Laboratory I (CHEM 2123). Lab fee of $30 required. Prerequisites: CHEM 2123 and CHEM 2323. Corequisite: CHEM 2325. (0-4) S

CHEM 2127 Honors Organic Chemistry Laboratory I (1 semester credit hour) Introduction to the experimental skills required for organic reactions. Experiments are designed to demonstrate concepts covered in CHEM 2327. Lab fee of $30 required. Corequisite: CHEM 2327. (0-3) Y

CHEM 2128 Honors Organic Chemistry Laboratory II (1 semester credit hour) Continuation of CHEM 2127. This course reinforces concepts presented in CHEM 2328, including reactions of aromatic and carbonyl containing compounds and the use of spectroscopy to identify reaction products. Lab fee of $30 required. Prerequisite: CHEM 2127. Corequisite: CHEM 2328. (0-3) Y

CHEM 2130 Introductory Organic Chemistry for Medical Science Laboratory (1 semester credit hour) The experimental skills associated with organic functional group reactions. Topics covered include fundamental skills, as well as selected experiments developed in a traditional two-semester Introductory Organic Chemistry Laboratory sequence (CHEM 2123 and CHEM 2125). Required course for students in the Partnership in Advancing Clinical Transition (UT-PACT) Program. May not be used to fulfill degree requirements for pre-health majors. Lab fee of $30 required. Corequisites: CHEM 2330 and instructor consent required. (0-4) Y

CHEM 2233 Introductory Organic Chemistry Laboratory (2 semester credit hours) Introduction to the experimental skills associated with organic functional group reactions. This course is designed to reinforce concepts presented in CHEM 2323 and CHEM 2325. Course consists of a hands-on laboratory and a separate associated lecture. Lab fee of $30 required. Prerequisite: CHEM 2323. Corequisite: CHEM 2325. (1-3) S

CHEM 2237 Honors Organic Chemistry Laboratory (2 semester credit hours) Introduction to the experimental skills associated with organic functional group reactions. This course is designed to reinforce concepts presented in CHEM 2327 and CHEM 2328. Course consists of a hands-on laboratory and a separate associated lecture. Lab fee of $30 required. Prerequisite: CHEM 2327.

Corequisite: CHEM 2328. (1-3) Y

CHEM 2323 (CHEM 2323) Introductory Organic Chemistry I (3 semester credit hours) The covalent bond. Organic chemistry: aliphatic and aromatic compounds; covalent inorganic and organometallic compounds; a survey of the organic functional groups and their typical reactions; stereochemistry. The first course in organic chemistry. Satisfies the basic organic chemistry lecture requirements for pre-health profession students. Students will also be registered for the exam section. Prerequisite: CHEM 1312 or CHEM 1316. (3-0) S

CHEM 2324 Introductory Organic Chemistry for Engineers (3 semester credit hours) Covers fundamental concepts and selected material developed in a traditional two-semester Introductory Organic Chemistry lecture sequence (CHEM 2323 and CHEM 2325), with a focus on those important for Engineering students. May not be used to fulfill degree requirements for pre-health majors. Prerequisites: (CHEM 1301 or CHEM 1312 or CHEM 1316) and department consent required. (3-0) Y

CHEM 2325 (CHEM 2325) Introductory Organic Chemistry II (3 semester credit hours) Continuation of CHEM 2323. Methods of structure determination. Synthesis, degradation, spectroscopy. Naturally occurring compounds: carbohydrates, amino acids and proteins, lipids, alkaloids. Students will also be registered for the exam section. Prerequisite: CHEM 2323. Corequisite: CHEM 2233. (3-0) S

CHEM 2327 Honors Organic Chemistry I (3 semester credit hours) This course, intended for students who have a solid background in general chemistry, offers a unified overview of fundamental organic chemistry, providing students with an integrated understanding of molecular architecture, molecular transformations, reaction energetics and mechanisms, synthetic strategy, and structure determination. Prerequisites: (CHEM 1312 or CHEM 1316) and instructor consent required. (3-0) Y

CHEM 2328 Honors Organic Chemistry II (3 semester credit hours) A continuation of the presentation of concepts begun in CHEM 2327. This course will present advanced topics including properties and reactions of aromatic compounds, reactions of carbonyl containing compounds, and the use of spectroscopic techniques to determine the structure of organic compounds. Prerequisite: CHEM 2327. Corequisite: CHEM 2237. (3-0) Y

CHEM 2330 Introductory Organic Chemistry for Medical Science (3 semester credit hours) Covers fundamental concepts and selected material developed in a traditional two-semester Introductory Organic Chemistry lecture sequence (CHEM 2323 and CHEM 2325). Required course for students in the Partnership in Advancing Clinical Transition (UT-PACT) Program. May not be used to fulfill degree requirements for pre-health majors. Prerequisites: (CHEM 1312 or CHEM 1316) and instructor consent required. Corequisite: CHEM 2130. (3-0) Y

CHEM 2401 Introductory Quantitative Methods in Chemistry (4 semester credit hours) A study of the theory, applications, and calculations involved in the methods of analysis. Theory and practice of volumetric, gravimetric, and spectrophotometric methods. Lab fee of $30 required. Prerequisites: CHEM 1112 and CHEM 1312. (2-6) Y

CHEM 2V01 Topics in Chemistry (1-3 semester credit hours) Subject matter will vary from semester to semester. May be repeated for credit as topics vary (9 semester credit hours maximum). Instructor consent required. ([1-3]-0) R

CHEM 3321 Physical Chemistry I (3 semester credit hours) Fundamental properties of macroscopic biophysical chemical systems are introduced and described in quantitative terms. A core of topics in thermodynamics, molecular motion, kinetics, molecular distributions and statistical thermodynamics is supplemented with topics germane to students taking physical chemistry with biophysical applications. Students will also be registered for the exam section. CHEM 3361 is recommended. Prerequisites: CHEM 2325 and (MATH 2415 or MATH 2451 or MATH 3351) or instructor consent required. (3-0) Y

CHEM 3322 Physical Chemistry II (3 semester credit hours) Fundamental microscopic properties of matter and radiation are discussed. A core of topics including quantum chemistry, atomic and molecular structure and spectroscopy, non-bonded interactions, and computational chemistry is supplemented with topics germane to students taking physical chemistry with biophysical applications. Students will also be registered for the exam section. Prerequisites: CHEM 2325 and (MATH 2415 or MATH 2451 or MATH 3351) or instructor consent required. (3-0) Y

CHEM 3341 Inorganic Chemistry I (3 semester credit hours) Survey of inorganic chemistry with emphasis on the modern concepts and theories of inorganic chemistry including electronic and geometric structure of inorganic compounds. Topics address contemporary physical and descriptive inorganic chemistry. Prerequisites: (CHEM 2323 and CHEM 2325) or equivalent. (3-0) Y

CHEM 3361 Biochemistry I (3 semester credit hours) Structures and chemical properties of amino acids; protein purification and characterization; protein structure and thermodynamics of polypeptide chain folding; catalytic mechanisms, kinetics and regulation of enzymes; energetics of biochemical reactions; generation and storage of metabolic energy associated with carbohydrates; oxidative phosphorylation and electron transport mechanisms; photosynthesis. Prerequisites: CHEM 2323 (or equivalent) and CHEM 2325 (or equivalent). Corequisite: BIOL 3161. (Same as BIOL 3361) (3-0) S

CHEM 3362 Biochemistry II (3 semester credit hours) Breakdown and synthesis of lipids; membrane structure and function; nitrogen metabolism and fixation; nucleotide metabolism; structure and properties of nucleic acids; sequencing and genetic engineering; replication, transcription, and translation; chromosome structure; hormone action; biochemical basis of certain pathological processes. Prerequisite: (BIOL 3361 or CHEM 3361) or its equivalent, or instructor consent required. Corequisite: BIOL 3162. (Same as BIOL 3362) (3-0) S

CHEM 3471 Advanced Chemical Synthesis Laboratory (4 semester credit hours) Careful handling practices and controlled variation of reaction parameters to obtain high yield syntheses. Use of standard separation techniques and spectrophotometric methods to identify reaction products and assess their purity. Lab fee of $30 required. Prerequisites: ((CHEM 2233 or CHEM 2237) and CHEM 2401) or instructor consent required. (1-7) Y

CHEM 3472 Instrumental Analysis (4 semester credit hours) Basic processes, instrumentation and

applications of ultraviolet, visible, fluorescence, atomic and mass spectroscopy, electrochemistry, surface and microanalysis, and separations. Emphasis will be placed upon acquisition, treatment, and interpretation of data and report writing. Lab fee of $30 required. Prerequisite: CHEM 2401. (2-6) Y

CHEM 3V92 Undergraduate Research in Biochemistry (2-6 semester credit hours) Students will pursue an independent project under the supervision of a member of the Chemistry, Biology, or UT Southwestern faculty. May be repeated for credit (9 semester credit hours maximum). Instructor consent required. ([2-6]-0) S

CHEM 4310 Introduction to Programming for Chemistry (3 semester credit hours) This course will introduce chemistry students to basic computer programming concepts, with an emphasis on topics important for chemistry research such as the retrieval, processing, and analysis of chemistry data. The course will primarily use the Python language, due to its availability and current popularity in scientific programming, and a brief overview of other languages will also be included. Students will learn how to programmatically access online chemistry databases such as the Protein Data Bank and retrieve data, and use the numpy, scipy, and sci-kit learn libraries to analyze chemical data sets and train machine-learning models. Prerequisite: CHEM 3321 or CHEM 3322. (3-0) R

CHEM 4311 Classical Simulations for Biological and Condensed Systems (3 semester credit hours) This course will focus on the application of the classical simulations to investigate and understand bio-related problems. The topics covered in this class include force field development, molecular dynamics (MD) simulations, free energy methods, and hybrid quantum mechanics and molecular mechanics (QM/MM) simulations. Prerequisites: (CHEM 3361 or BIOL 3361) and CHEM 3321 and CHEM 3322. (3-0) R

CHEM 4332 Total Synthesis of Natural Products (3 semester credit hours) This course covers the reactions, strategies, and tactics needed to tackle the challenge presented by architecturally complex natural products. Examples of cutting-edge methods for bond-forming reactions will be presented, as will the tools necessary to logically analyze and build complex molecular targets. The course covers the principles of retrosynthetic analysis with the goal of teaching the students how to logically analyze complex molecular targets and design a total synthesis, two highly coveted skills in a world where many industries (such as drug discovery and development) are moving toward increasingly complex targets. Prerequisite: CHEM 2325 or CHEM 2328. (3-0) R

CHEM 4335 Polymer Chemistry (3 semester credit hours) Macromolecules. Synthesis, structure, and properties of polymers. Polymer-polymer and polymer-solvent interactions. Applications in industry and biochemistry. Prerequisite: (CHEM 3321 or CHEM 3322) or instructor consent required. (3-0) Y

CHEM 4340 Advanced Polymer Science and Engineering (3 semester credit hours) Polymer structure-property relations, Glass transition temperature and mechanical properties of polymers, thermoplastics, thermosets, and elastomers, rheology of polymers, biodegradable and biocompatible polymers for drug delivery. Prerequisite: CHEM 2325. (3-0) R

CHEM 4342 Nanomedicine: Fundamentals and Applications (3 semester credit hours) Integration of nanotechnology and medicines is revolutionizing disease diagnosis and treatment. In this course, we will discuss nano-bio interactions and transport at the cellular and animal levels and how to use these interactions and transport to address long-standing challenges in cancer and other diseases. Prerequisites: (CHEM 2323 or CHEM 2327) and CHEM 3472. (3-0) R

CHEM 4355 Computational Modeling (3 semester credit hours) This course will introduce students to computational modeling approaches commonly used to tackle chemical and biophysical problems. Prerequisites: CHEM 3321 and (MATH 2451 or MATH 3351) or instructor consent required. (3-0) Y

CHEM 4361 Physical Biochemistry (3 semester credit hours) Protein structure, fundamental metabolism, structures and properties of macromolecules, interactions with electromagnetic radiation, thermodynamics of macromolecular solutions, transport processes, and other topics. Prerequisite: CHEM 3361 or BIOL 3361. (3-0) R

CHEM 4369 Bioinorganic Chemistry (3 semester credit hours) The course will cover advanced topics in bioinorganic chemistry including: principles of coordination chemistry, crystal and ligand field theory, inorganic elements in biochemistry, biological metal ligands, metalloproteins and metalloenzymes, oxygen transport and activation, electron transfer in metalloproteins, metal transport (membranes, energy, channels, pumps), and metals in medicine. Prerequisites: (CHEM 3361 or BIOL 3361) and CHEM 3341. (3-0) R

CHEM 4370 Carbon Capture and Sequestration (3 semester credit hours) The goal of this course is to provide students with a modern view of current and emerging research in carbon capture and sequestration (CCS). Topics will include our current understanding of CO2 in and around the planet, the geological storage of CO2, and the science and technology of capturing CO2 with a focus on material chemistry aspects. Development of analytical methods and characterization tools for assessing CCS properties and materials will also be discussed. Through this series of lectures, students will learn about contemporary research related to CCS, as well as learn to develop, analyze, and compare various CCS solutions. Prerequisite: CHEM 2325. (3-0) R

CHEM 4375 Supramolecular Chemistry (3 semester credit hours) This course would cover fundamental host-guest chemistry, self-assembly through polymeric materials, and extended solid-state structures (coordination polymers and MOFs). Applications of supramolecular chemistry in the design of molecular machines and synthetic enzyme and protein mimics will also be a major component. The concepts behind practical techniques for characterizing supramolecular complexes and interactions (Job Plots, solution and solid phase spectroscopy, calorimetry, etc.) will also be covered. (3-0) R

CHEM 4381 Green Chemistry and Green Fuels (3 semester credit hours) This course encompasses the study of the sources, reactions, transport, effects, and fates of chemical species in water, soil, and air environments and the effects of technology thereon. Prerequisite: CHEM 2325 or instructor consent required. (3-0) T

CHEM 4390 Research and Advanced Writing in Chemistry (3 semester credit hours) For students

conducting independent research and scientific writing. Students will pursue an independent project under the supervision of a member of the Chemistry faculty. Subject and scope to be determined on an individual basis. This course satisfies the university advanced writing requirement. Instructor consent required and submission of research plans with approval from supervising faculty and the Undergraduate Committee in Chemistry. Prerequisite: at least 3 semester credit hours of undergraduate research (e.g. CHEM 4V91). (3-0) S

CHEM 4399 Research and Advanced Writing in Chemistry for Honors Students (3 semester credit hours) For students conducting independent research for honors theses or projects. Satisfies the university advanced writing requirement. Prerequisites: Senior level standing with at least 3 semester credit hours of undergraduate research (e.g. CHEM 4V91), and consent of supervising faculty and (filing a research plan approved by supervising faculty and the Undergraduate Committee in Chemistry prior to the 12th class day). (3-0) S

CHEM 4473 Physical Measurements Laboratory (4 semester credit hours) Modules may include topics in physical chemistry and biophysics such as bio-nanotechnology, calorimetry, centrifugation, computational methods, computer-instrument interfaces, electrochemistry, electronics, kinetics, literature skills, property of matter, spectroscopy, and statistical methods. Lab fee of $30 required. Prerequisites: ((CHEM 3321 or CHEM 3322) and CHEM 3472) or instructor consent required. (1-7) Y

CHEM 4V01 Topics in Chemistry (1-9 semester credit hours) Subject matter will vary from semester to semester. Examples would include, as required, bioorganic chemistry, industrial processes, applied spectroscopy, drugs and people, practical analysis, or other topics that span several subdisciplines. May be repeated for credit as topics vary (9 semester credit hours maximum). Instructor consent required. ([1-9]-0) R

CHEM 4V91 Research in Chemistry (2-6 semester credit hours) Students will pursue an independent project under the supervision of a member of the Chemistry faculty. May be repeated for credit (12 semester credit hours maximum). Instructor consent required. ([2-6]-0) S