CHEMISTRY (CHE)

CHE 100 Chemistry Essentials Credits: 3
Typically Offered: Fall, Spring.
Course Description: Lecture only for non-science majors. A survey of chemical concepts and applications that emphasizes consumer and societal issues. Three hours lecture.

CHE 101 Introductory Chemistry Credits: 4
Typically Offered: Fall, Spring.
Course Description: Chemistry for liberal arts and sciences students; meets the minimum physical science requirement. Three hours lecture, two hours lab.
CORE 42: MOTR CHEM 100L; Essentials in Chemistry with Lab (attributes MO33, MLAB)

CHE 111 General Chemistry I Credits: 5
Typically Offered: Fall, Spring.
Course Description: Basic concepts of chemistry: atomic theory and periodic system, chemical calculations, oxidation-reduction, states of matter, theory of chemical bonding, atomic structures. Four hours lecture, three hours lab. **Prerequisite(s):** ACT Math subscore of at least 22 or a grade of C or higher in MAT 110E or score of 70 or higher on the MWSU Math Placement Exam, or the equivalent.
CORE 42: MOTR CHEM 150L; Chemistry with Lab (attributes MO33, MLAB)

CHE 112 Problem Solving for General Chemistry I Credits: 1
Typically Offered: Fall, Spring.
Course Description: Elective course to accompany CHE 111 General Chemistry I. Focused instruction on problem solving strategies and tools associated with course content of General Chemistry I. Topics include symbolic chemical language, mathematics of General Chemistry, unit conversions and unit analysis, essential graphing, word problem strategies, employing technology to solve problems, and critical analysis of results. This course must be taken concurrently with CHE 111. Graded on a pass/fail basis.

CHE 120 General Chemistry II with Qualitative Analysis Credits: 5
Typically Offered: Fall, Spring.
Course Description: Continuation of CHE 111. Thermochemistry, equilibrium, electrochemistry, radiochemistry, coordination chemistry, and a survey of the main group elements and their compounds. Laboratory includes the topics above along with the separation and identification of some of the more common anions and cations by qualitative analysis. Four hours lecture, three hours laboratory. **Prerequisite(s):** A grade of C or higher in CHE 111 and a grade of C or higher in MAT 116, or a Math score ACT of 25 or higher, or the equivalent.

CHE 121 Problem Solving for General Chemistry II Credits: 1
Typically Offered: Fall, Spring.
Course Description: Elective course to accompany CHE 120 General Chemistry II. Focused instruction on problem solving strategies and tools associated with course content of General Chemistry II. Topics include mathematics of General Chemistry II including applications of algebra for solving problems in kinetics, thermodynamics and chemical equilibria, and solving complex word problems. This course must be taken concurrently with CHE 120. Graded on a pass/fail basis.

CHE 150 Basic Laboratory Skills Credits: 3
Typically Offered: Summer.
Course Description: An immersive laboratory experience in which students learn basic chemical laboratory skills that will prepare them for a laboratory apprenticeship experience. Skills include laboratory safety, chemical and waste management, use of a balance, use of calibrated glassware and equipment, preparation of solutions, use of basic laboratory instrumentation, and titration. One hour lecture, six hours lab per week. **Prerequisite(s):** A grade of C or higher in BIO 101, BIO 105, or BIO 106, a grade of C or higher in CHE 111, and a grade of C or higher in MAT 116.

CHE 283 Introduction to Research Methods in Chemistry Credits: 1-3
Typically Offered: Departmental Discretion.
Course Description: Introduction to basic research in chemistry. Individual and team projects involving methods for solving chemistry-related research problems. May be repeated for credit. **Prerequisite(s):** High school chemistry, freshman or sophomore standing, and departmental approval.

CHE 290 Chemical Laboratory Apprenticeship I Credits: 1
Typically Offered: Fall, Spring, Summer.
Course Description: Immersive on the job laboratory training experience with a Chemical Laboratory Technician Apprenticeship partner organization. This course may be repeated until a total of 2000 hours of on the job training have been completed. **Prerequisite(s):** Successful completion of the Laboratory Technician Pre-Apprenticeship Microcredential and departmental approval.

CHE 295 Colloquium in Chemistry Credits: 1
Typically Offered: Departmental Discretion.
Course Description: An introduction to careers in chemistry and chemistry related fields. Breadth of career paths and educational requirements for those paths will be emphasized. **Prerequisite(s):** Freshman or sophomore standing, or departmental approval.

CHE 308 History and Philosophy of the Natural Sciences Credits: 3
Typically Offered: Spring.
Course Description: A study of the history of the natural sciences with an emphasis on the philosophical analysis of these events. Same as BIO 308 and PHL 308. **Prerequisite(s):** Completion of General Studies Mathematics and Natural Sciences requirements.

CHE 310 Organic Chemistry I Credits: 3
Typically Offered: Fall.
Course Description: Methods of synthesis of organic compounds, reaction paths, chemical bonding, and geometry of organic molecules; aliphatic and aromatic compounds. Topics include substitution, elimination, and electrophilic addition reactions and mechanisms along with an overview of functional groups. Three hours lecture. **Prerequisite(s):** A grade of C or higher in CHE 120.

CHE 311 Organic Chemistry Laboratory I Credits: 2
Typically Offered: Fall.
Course Description: Laboratory course to accompany CHE 310 Organic Chemistry I lecture. One hour lecture and three hours lab. **Prerequisite(s):** Credit or concurrent enrollment in CHE 310.

CHE 312 Organic Chemistry II Credits: 3
Typically Offered: Spring.
Course Description: Reactions, mechanisms and methods of synthesis of organic compounds. Topics include oxidation & reduction, conjugated & aromatic systems, aromatic substitution, amines, carboxylic acids and derivatives, carbonyl compounds, polymerization and carbohydrates. Three hours lecture. **Prerequisite(s):** A grade of C or higher in CHE 310 and CHE 311.

CHE 313 Organic Chemistry Laboratory II Credits: 2
Typically Offered: Spring.
Course Description: Laboratory course to accompany CHE 312. Six hours lab. **Prerequisite(s):** Credit or concurrent enrollment in CHE 312.

CHE 321 Quantitative Analysis Credits: 4
Typically Offered: Fall.
Course Description: Analytical chemistry; gravimetric, volumetric, colorimetric, and electroanalytical determinations. Two hours lecture, six hours lab. **Prerequisite(s):** A grade of C or higher in CHE 120.

CHE 326 Instrumental Analysis Credits: 4
Typically Offered: Spring.
Course Description: Theories and methods in modern instrumental analysis. Three hours lecture, three hours lab. **Prerequisite(s):** A grade of C or higher in CHE 310, CHE 311, and CHE 321.

CHE 340 Foundations of Physical Chemistry Credits: 4
Typically Offered: Fall.
Course Description: A foundational course in Physical Chemistry covering thermodynamics, chemical equilibrium, properties of solutions, electrochemistry, kinetic theory of gases, and chemical kinetics.
Prerequisite(s): A grade of C or higher in CHE 310, CHE 311, PHY 110, and MAT 167.

CHE 370 Biochemistry I Credits: 4
Typically Offered: Fall, Spring.
Course Description: An introduction to biological compounds their roles within cells and biological systems with an emphasis on structure and function, energy and metabolism, and biological storage of information. Three hours lecture, three hours lab. CHE 312 recommended.
Prerequisite(s): A grade of C or higher in CHE 310 and CHE 311.

CHE 380 Environmental Chemistry & Chemical Management Credits: 3
Typically Offered: Spring (odd-numbered years).
Course Description: Study of environmental chemistry as it affects the operation of chemical facilities in a global society and the application of chemical knowledge to important current problems, including safe chemical storage and waste management. This course will provide background for understanding the demands of the chemical industrial workplace or for advanced study of these topics. **Prerequisite(s):** A grade of C or higher in CHE 310, CHE 311, and CHE 321.

CHE 420 Chemistry Laboratory Assistantship Credits: 1,2
Typically Offered: Fall, Spring, Summer.
Course Description: A laboratory assistant experience within a teaching laboratory. This experience may not be substituted for other courses required in the student's major area. Course grades are assigned on a pass/fail basis. May be repeated for credit. **Prerequisite(s):** A grade of C or higher in CHE 111 and department approval.

CHE 426 Instrumental Methods Credits: 5
Typically Offered: Departmental Discretion.
Course Description: Modern methods of chemical instrumentation; includes both practical application; and fundamental theories of instrumental analyses. Three hours lecture, six hours lab. **Prerequisite(s):** CHE 321 and CHE 340.

CHE 441 Advanced Inorganic Chemistry Credits: 3
Typically Offered: Spring (even-numbered years).
Course Description: Modern concepts of inorganic chemistry, encompassing chemical bonding theories, acid-base theories, mechanisms of inorganic chemistry, symmetry in molecules, inorganic thermodynamics, and atomic and molecular structure. Three hours lecture. **Prerequisite(s):** CHE 310 and CHE 311.

CHE 442 Inorganic Synthesis Credits: 1
Typically Offered: Departmental Discretion.
Course Description: Selected synthetic techniques involving inert atmosphere, non-aqueous solvents, vacuum manipulation, and electrolytic oxidation, as currently applied to the purification and characterization of a wide variety of inorganic materials. Three hours lab.
Prerequisite(s): CHE 310, CHE 311, and credit or concurrent enrollment in CHE 441.

CHE 445 Advanced Topics in Chemistry Credits: 3
Typically Offered: Departmental Discretion.
Course Description: Advanced material in Organic, Inorganic, Physical, Analytical, or Biochemistry, taught on a rotational basis. Specific topics may include, but are not limited to: Applied Spectroscopy, Chemical Kinetics, Macromolecular Chemistry (Polymers), Physical Inorganic Chemistry, Applied Chromatography, Advanced Organic Chemistry, or Advanced Biochemistry. This course may be repeated for credit for multiple topics. **Prerequisite(s):** CHE 312 and CHE 340.

CHE 450 Independent Research/Project Credits: 1-5
Typically Offered: Fall, Spring, Summer.
Course Description: Investigation of a research problem, project, or topic on an individual conference basis. May be repeated for credit.
Prerequisite(s): Minimum of 2.5 GPA in major field, and departmental approval.

CHE 465 Chemistry Teaching: Methods and Techniques Credits: 3
Typically Offered: Departmental Discretion.
Course Description: Modern techniques in teaching high school chemistry: use of multimedia equipment, project approach, lesson planning, accreditation standards at state and national levels, and difficulties in chemistry instruction at the secondary level.
Prerequisite(s): CHE 310 or departmental approval.

CHE 470 Biochemistry II Credits: 3
Typically Offered: Spring (even-numbered years).
Course Description: Continuing study of the biochemical basis of biological systems with a more expansive understanding of biomolecular structure and function, the interaction of biological molecules, energy and intermediary metabolism, biological signaling, and methods used for biochemical study. Three hours lecture. CHE 312 recommended.
Prerequisite(s): A grade of C or higher in CHE 370.

CHE 475 Internship in Chemistry Credits: 1-3
Typically Offered: Fall, Spring, Summer.
Course Description: An extracurricular experience related to a unique approved chemistry career experience or a preprofessional experience. Course grades assigned on a Pass/Fail basis. May be taken for up to 6 credit hours. **Prerequisite(s):** Junior or Senior standing, a declared major in the Department of Chemistry, and departmental approval.

CHE 480 Advanced Physical Chemistry Credits: 4
Typically Offered: Spring (odd-numbered years).
Course Description: Second course in physical chemistry covering quantum chemistry, spectroscopy, bonding, and statistical thermodynamics. **Prerequisite(s):** Grade of C or better in CHE 340, PHY 111, and either MAT 177 or MAT 287.

CHE 485 Chemistry Capstone Experience Credits: 2
Typically Offered: Fall.
Course Description: A capstone laboratory experience. Covering research methodology, project planning, use of the chemical literature, experimentation, and scientific presentations with a mesoscale, supramolecular, nanoscale (MSN) focus. **Prerequisite(s):** A grade of C or higher in CHE 310, CHE 311, and CHE 321.

CHE 490 Research in Chemistry Credits: 1-3
Typically Offered: Fall, Spring Summer.
Course Description: Original research on problems in various fields of chemistry. Hours arranged. May be repeated for credit. Students are expected to work a minimum of 3 hours per week for each credit hour enrolled. A presentation of the work is required at the end of each enrolled term. A summary of the work will be provided to the research advisor (irrespective of credit hours) and written reports of the work must be submitted for research projects involving 2 or more credit hours. May be repeated for credit. **Prerequisite(s):** CHE 310 and CHE 311 or consent of department chairperson.