

# School of Mathematics and Physical Sciences

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## Contact Information

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The School of Mathematics and Physical Sciences provides students with a strong foundation in the mathematical, chemical, physical, and geoscience disciplines while supporting the educational needs of students across the university. The School offers programs that prepare graduates for careers in industry, government, research, healthcare, education, and other professional fields, as well as for advanced study.

Faculty are committed to excellence in teaching, research, and student success, providing rigorous academic programs that develop analytical reasoning, critical thinking, quantitative problem-solving, technical communication, computational skills, and scientific inquiry. Through coursework, laboratory experiences, and interdisciplinary learning opportunities, students gain the knowledge and practical skills necessary to succeed in a rapidly evolving scientific and technological environment.

The school serves three primary groups of students:

- Students pursuing majors, minors, and certificates in mathematics, chemistry, physics, and related disciplines.
- Students in engineering, agriculture, education, health professions, and other technical or pre-professional programs requiring coursework in the mathematical and physical sciences.
- Students completing core curriculum science and mathematics requirements or exploring these disciplines through elective coursework.

The school offers undergraduate degree programs in Chemistry, Mathematics, and Physics, along with a variety of minors and undergraduate certificates.

Additional undergraduate opportunities include minors in Chemistry, Mathematics, Physics, and Geographic Information Systems (GIS), as well as certificates in Nano Materials Science and Engineering, Geographic Information Systems (GIS), and Nuclear Power Plant (NPP) Operations.

The School also provides service courses that support degree programs throughout the university and offers specialized instruction in areas including statistics, GIS, energy, hydrogeology, groundwater modeling, and related fields. Students are encouraged to work closely with faculty advisors to develop degree plans that support their educational and career goals.

The school is committed to student success at every level of mathematical preparation. Students enrolling in introductory mathematics courses are placed according to applicable placement criteria, including TSIA mathematics scores, high school GPA, previous mathematics coursework, and other university placement guidelines. Corequisite support options are available for students who are not TSI complete or exempt in mathematics. These developmental corequisite courses are designed to strengthen foundational mathematical skills while supporting success in college-level mathematics. Developmental corequisite courses receive credit/non-credit grades, are not included in the student's GPA, do not satisfy degree requirements, and are not offered as standalone courses, but they do count toward satisfactory academic progress (SAP) for financial aid purposes.

## Astronomy (ASTR)

### **ASTR 1103 Stars and Galaxies Laboratory 1 SCH (0-3)**

A laboratory course to accompany ASTR 1303. Prerequisite: credit or registration in ASTR 1303.

### **ASTR 1104 Solar System Laboratory 1 SCH (0-3)**

A laboratory course to accompany ASTR 1304. Prerequisite: credit or registration in ASTR 1304.

Fee: \$5.00

### **ASTR 1303 Stars and Galaxies 3 SCH (3-0)**

A survey of stellar astronomy and cosmology. Topics include the behavior of light; the sun as a star; positions, motions and brightness of the stars; stellar evolution; the Milky Way and other galaxies; and cosmology. Concurrent enrollment in ASTR 1103 is recommended.

### **ASTR 1304 Solar System 3 SCH (3-0)**

A survey of the astronomy of our solar system. Topics include the history of astronomy, naked-eye phenomena, telescopes, gravity and orbits and the nature and history of the Earth, moon, planets, asteroids and comets. Concurrent enrollment in ASTR 1104 is recommended.

## Chemistry (CHEM)

### **CHEM 1111** General Chemistry I Lab **1 SCH (0-3-1)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes an understanding of the principles of stoichiometry, gases, liquids, solutions and energy. One hour of recitation. Pre- or corequisite: CHEM 1311.

Fee: \$25.00

### **CHEM 1112** General Chemistry II Lab **1 SCH (0-3-1)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes an understanding of the principles of stoichiometry, gases, liquids, solutions and energy. One hour of recitation. Prerequisite: CHEM 1311 and CHEM 1111; Pre- or corequisite: CHEM 1312.

Fee: \$25.00

### **CHEM 1311** General Chemistry I **3 SCH (3-0)**

The first course for students majoring in a field of science, engineering or agriculture. Principles of stoichiometry, thermochemistry, atomic and molecular structures, gases, liquids, solids and solutions and the chemistry of the elements and their compounds. Prerequisite: MATH 1314 and either one year of high school chemistry or CHEM 1481.

### **CHEM 1312** General Chemistry II **3 SCH (3-0)**

The second course for students majoring in a field of science, engineering or agriculture. Principles of chemical kinetics, chemical equilibrium, thermodynamics, electrochemistry and the chemistry of the elements and their compounds. Prerequisites: CHEM 1111 and CHEM 1311.

### **CHEM 1405** Introductory Chemistry I **4 SCH (3-2)**

Elementary studies in chemistry for those students not majoring in science. Emphasizes body chemistry and physiological action of drugs, foods, nutrients, poisons, cancer-causing agents, etc. Includes environmental, social, political, historical and agricultural aspects of the science.

Fee: \$15.00

### **CHEM 2401** Inorg Quantitative Analysis **4 SCH (3-4)**

Principles and methods of separation and analysis. Includes standard volumetric and gravimetric methods and an introduction to instrumental methods. Prerequisites: CHEM 1112 and CHEM 1312.

Fee: \$25.00

### **CHEM 2421** Elem Organic Chemistry **4 SCH (3-3)**

Aliphatic and aromatic compounds with a special emphasis given to aliphatic compounds. Prerequisite: CHEM 1112 and CHEM 1312.

Fee: \$25.00

### **CHEM 3123** Organic Chemistry Lab I **1 SCH (0-4)**

Introduction to laboratory practices and procedures in organic chemistry, with emphasis on hydrocarbon chemistry. Pre- or corequisite: CHEM 3323.

Fee: \$25.00

### **CHEM 3125** Organic Chemistry Lab II **1 SCH (0-4)**

Introduction to laboratory practices and procedures in organic chemistry, with emphasis on hydrocarbon chemistry. Pre- or corequisite: CHEM 3325.

Fee: \$25.00

### **CHEM 3181** Chemical Literature **1 SCH (1)**

Survey of chemical literature, electronic databases, and other internet sources to search for chemical information. Introduction to library sources, book loans, access to e-books and journals. Prerequisite: CHEM 3323

### **CHEM 3323** Organic Chemistry I **3 SCH (3-0)**

Introduction to the important concepts and principles in the bonding and reactions of organic molecules, with intensive study of the chemistry of non-aromatic hydrocarbons. Prerequisites: CHEM 1312, CHEM 1112. To count for a major or minor in Chemistry, CHEM 3123 must also be taken.

### **CHEM 3325** Organic Chemistry II **3 SCH (3-0)**

Continuation of CHEM 3323. An intensive study of the reactions and mechanisms of aromatic hydrocarbons and the main non-hydrocarbon functional groups. Prerequisites: CHEM 3323, CHEM 3123. To count for a major or minor in Chemistry, CHEM 3125 must also be taken.

### **CHEM 3331** Physical Chemistry I **3 SCH (3-0)**

Study of physical and chemical phenomena. Thermodynamics, including thermodynamics laws, thermal chemistry, phase transitions, electrochemistry and chemical equilibrium. Prerequisites: CHEM 3325 and one semester each of physics and calculus.

### **CHEM 3332** Physical Chemistry II **3 SCH (3-0)**

Study of physical and chemical phenomena. Chemical kinetics, quantum mechanics, spectroscopy, statistical thermodynamics and molecules in motion. Prerequisites: CHEM 3331 and two semesters each of physics and calculus.

### **CHEM 3385** Undergraduate Research (WI) **1-3 SCH (1-3)**

Supervised individual journal-quality research involving advanced chemical concepts and a variety of experimental techniques and instruments. May be taken for a maximum of 6 semester hours. Prerequisites: At least one semester of chemistry and prior approval of research project director.

**CHEM 4111 Adv Inorganic Chemistry Lab 1 SCH (0-4)**

Developing laboratory skills in synthesis and characterization of main group and transition metal compounds. Applying concepts of acid and bases, redox reactions, bonding and structure, and coordination chemistry in laboratory work. Compounds are characterized using chemical and instrumental methods (UV, IR, and NMR spectroscopy). Prerequisite: CHEM 2401; Pre- or corequisite: CHEM 4311.

Fee: \$25.00

**CHEM 4131 Physical Chem Measurements I 1 SCH (0-4)**

A laboratory course on the techniques and apparatus used in the measurement of properties of chemical systems. Attention is also given to the limits of accuracy and the sources of error in a given technique. Required of chemistry majors. Prerequisite or corequisite: CHEM 3331.

Fee: \$25.00

**CHEM 4132 Physical Chem Measurements II 1 SCH (0-4)**

A laboratory course on the techniques and apparatus used in the measurement of properties of chemical systems. Attention is also given to the limits of accuracy and the sources of error in a given technique. Required of chemistry majors. Prerequisite or corequisite: CHEM 3332.

Fee: \$25.00

**CHEM 4141 Biochemistry Laboratory 1 SCH (0-4)**

An introduction to the biochemical techniques and methods used for protein purification, for protein characterization and for analysis of other important biomolecules. Pre- or co-requisite: CHEM 4341.

**CHEM 4181 Chemical Seminar 1 SCH (1-0)**

Presentation of a topic in chemistry including design of slides, presentation of chemical content (reaction equations, chemical drawings and schemes), speech and structure of presentation, citation of content, interaction with audience, answers and questions. Prerequisite: CHEM 3181.

**CHEM 4303 Forensic Chemistry 3 SCH (3-0)**

Theory, concepts and application of forensic chemistry to complex problem solving related to crime detection and solving of crime via chemical means. Mass spectrometry, chromatography, and spectroscopy. Prerequisite: CHEM 2401 or equivalent level analytical or bioanalytical chemistry course.

**CHEM 4311 Advance Inorganic Chemistry 3 SCH (3-0)**

Review of atomic structure, structure and bonding, acid-base and redox concepts, and reaction principles. Detailed discussion of solid state structures, periodic trends of elements and their compounds, industrial processes for the recovery of elements from natural sources, and production of generic inorganic compounds. Application of chemical elements and their compounds. Prerequisite: CHEM 2401.

**CHEM 4313 Chemistry and Nanoscience 3 SCH (3-0)**

Chemical, optical, electronic, and magnetic interactions produced by nanomaterials, the relationship between microstructural scale and its influence on physical mechanism, and appropriate applications such as solar devices, fuel cells or biomedical agents. Prerequisite: Junior standing and approval of the instructor.

**CHEM 4332 Molecular Modeling 3 SCH (3-0)**

This senior#level undergraduate course introduces the principles and applications of molecular modelling in chemistry and biochemistry. Students will explore molecular mechanics, quantum chemical methods, conformational analysis, solvent effects, intermolecular interactions, docking, and molecular dynamics. Emphasis is placed on computational approaches to predict molecular structure, stability, and reactivity, with applications in drug design, catalysis, and materials chemistry. Coursework includes three mid#semester exams, a comprehensive final, and computational projects using modern modelling software.

**CHEM 4341 Biochemistry I 3 SCH (3-0)**

Introduction to the important concepts, nomenclature and compounds of biochemistry with special emphasis on the chemical interpretation of the structures and functions of biological macromolecules. Prerequisite: CHEM 3325.

**CHEM 4342 Biochemistry II 3 SCH (3-0)**

An introduction to the major biochemical cycles and pathways in living organisms, including reaction steps, regulation and mechanisms. Prerequisite: CHEM 4341.

**CHEM 4345 Principles of Biochemistry 3 SCH (3-0)**

A one-semester presentation of the major areas of biochemistry, emphasizing the structure and function of biomolecules and major metabolic activities of living organisms, including humans. Prerequisites: CHEM 2421 or CHEM 3325.

**CHEM 4381 Selected Topics in Chemistry 1-3 SCH (1-3)**

Literature and research in areas of chemistry not otherwise treated in depth in available courses. May be repeated when topic changes for a maximum of 6 semester hours of credit.

**CHEM 4385 Senior Research (WI) 1-3 SCH (1-3)**

Supervised individual journal-quality research involving advanced chemical concepts and a variety of experimental techniques and instruments. May be taken for a maximum of 6 semester hours. Prerequisites: CHEM 3331 and CHEM 3332, senior standing and prior approval of the research project director.

**CHEM 4401 Mod Meth of Instrumental Anal 4 SCH (3-4)**

Introduction to the theory and practice of optical, separation, and electro-analytical methods of analysis, including UV/Visible spectroscopy, mass spectroscopy, NMR, gas chromatography, and HPLC. Prerequisites: CHEM 2401 or CHEN 2371; and CHEM 3331.

Fee: \$25.00

**CHEM 4421** Advanced Chemical Synthesis **4 SCH (2-6)**

Introduction to advanced and sophisticated synthesis of organic, biochemical and inorganic compounds. Laboratory includes multi-step syntheses, stereochemical problems, literature-searching techniques, etc. Prerequisites: CHEM 3325 and CHEM 3125.

Fee: \$25.00

## Geography (GEOG)

**GEOG 1301** Physical Geography Meteorology **3 SCH (3-0)**

Earth motions and their meanings; system of location and time; composition and structure of the earth's atmosphere. Meteorology and weather prediction, including storms. Air pollution meteorology. Field trips will be arranged.

**GEOG 1303** World Regional Geography **3 SCH (3-0)**

Major geographic regions of the world. Landscapes and peoples of continents; major culture realms and nations, resources, land-use and industries. Contrasts between developed and emerging nations.

**GEOG 2472** Intro to Geographic Info Sys **4 SCH (3-3)**

Principles and experience of Geographic Information Systems. Acquisition, management, processing, and interpretation of geographic data. Spatial data structure and the display, manipulation, and analysis of geographic data. Field trip required. Field trip fee required. Prerequisite: 3 hours of natural science or permission of instructor. Field Trip Fee required.

Fee: \$40.00

**GEOG 3305** Environmental Geography **3 SCH (3-0)**

The nature, geographic distribution, use and misuse of global resources with emphasis on those of North America. Ecosystems, air, water, soil, mineral and energy resources will be considered. Prerequisites: 3 semester credit hours of Geography or a science course (see General Education Requirements natural sciences component).

**GEOG 3421** Geomorphology **4 SCH (3-3)**

Description, classification and quantitative analysis of landforms and surface processes in relation to human development. Regional physiography of the United States and topographic map interpretation. May be used as geology credit. Field trip required. Field trip fee required. Prerequisite: GEOL 1302/ GEOL 1102 or GEOL 1303/GEOL 1103, MATH 1316. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

**GEOG 3450** Field Mapping Cartography **4 SCH (3-3)**

The principles and practice of plane surveying and the global positioning system (GPS) and their interface with geographic information systems (GIS). Basic principles of cartography and use of cartographic tools and software. Management of cartographic data and GPS data. Local field trips required. Field trip fee required. Prerequisite: MATH 1316 or MATH 1324. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

**GEOG 3460** GIS in Nat Res and Envir Mgmt **4 SCH (3-3)**

GIS and other geospatial technologies (including GPS and remote sensing) as applied to natural resources and environmental management. Technologies and techniques used to acquire geographic information, spatial data and location analysis, and applications of geospatial technology within the natural and environmental sciences. Case studies, labs, and field exercises. Prerequisite: GEOG 2472 (preferred), or six hours of physical or life science, or permission of instructor.

**GEOG 4429** Advanced GIS **4 SCH (3-3)**

Advanced techniques and applications of Geographic Information Systems. GIS data structure and conversions, advanced spatial analysis, data visualization, hydrological modeling. Basic and intermediate GIS programming for customizing and manipulating GIS applications. May be used as a geology credit. Prerequisite: GEOG 2472 or permission of instructor.

**GEOG 4435** Remote Sensing **4 SCH (3-3)**

The technology and interpretation of aerial photography and satellite imagery, including multi-spectral, thermal and radar images. Digital image processing using a raster geographic information system. Applications of remote sensing and guided projects in areas of student interest. May be used as a geology credit. Prerequisite: MATH 1314 and 6 hours of science, engineering or agriculture.

Fee: \$5.00

## Geology (GEOL)

**GEOL 1101** Earth Science NonSci Maj I Lab **1 SCH (0-2)**

A laboratory experience that focuses on laboratory techniques, data collection, and analysis. Reinforces and promotes greater understanding of concepts presented in GEOL 1301. Prerequisite: credit or registration in GEOL 1301.

Fee: \$5.00

**GEOL 1102** Intro Ocean Astron & Atmos Lab **1 SCH (0-2)**

A laboratory experience that focuses on laboratory techniques, data collection, and analysis. Reinforces and promotes greater understanding of concepts of the oceans, the hydrosphere and atmosphere, and astronomy as presented in GEOL 1302. Prerequisite: credit of registration in GEOL 1302.

Fee: \$5.00

**GEOL 1103** Physical Geology Laboratory **1 SCH (0-2)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes greater understanding of earth materials and the physical processes at work on and in the earth. Prerequisite or corequisite: GEOL 1303.

Fee: \$5.00

**GEOL 1104** Historical Geology Lab **1 SCH (0-2)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes greater understanding of the events and processes that have shaped the earth and influenced the development of life through time. Prerequisite or corequisite: GEOL 1304.

Fee: \$5.00

**GEOL 1301** Earth Sciences for Non-Sci Maj **3 SCH (3-0)**

Study of the earth and the concepts and physical properties responsible for its problems including volcanoes, earthquakes, floods and droughts. Includes the study of plate tectonics, physical geology and geomorphology. Field trips may be arranged. Designed for students not majoring in science or engineering.

**GEOL 1302** Intro Ocean, Astron & Atmos **3 SCH (3-0)**

Survey of earth's dynamic systems: the oceans, the hydrosphere and the atmosphere. Survey of astronomy emphasizing earth's place in the universe. Field trips may be arranged. Designed for students not majoring in science or engineering. Open to geosciences majors.

**GEOL 1303** Physical Geology **3 SCH (3-0)**

General composition and form of the earth's surface and the volcanic, erosional, depositional and deformational processes which operate on it. The properties of the interior of the earth inferred from earthquakes and other external evidence. Occasional field trips may be arranged.

**GEOL 1304** Historical Geology **3 SCH (3-0)**

The important change through which the earth has passed since its origin as a planet; especially, the history of the orderly evolution of life and physical features evidenced in the rocks of the earth. Field trip and field trip fee required. Prerequisite: GEOL 1303. Field Trip Fee will be required.

Fee: \$20.00

**GEOL 2376** Nature of Earth and Universe **3 SCH (3-2)**

Survey of the basic concepts of geosciences. This course begins with an introduction to astronomy and the Earth's position in our solar system. The course includes the interrelationships between the solid portion, hydrosphere, atmosphere and biosphere of the Earth. Prerequisite: BIOL 2375, CHEM 1376.

**GEOL 3107** Field Geology Laboratory **1 SCH (0-3)**

Methods of collection of geological field data and its presentation; proper use of geological field and lab equipment and instruments; interpretation of various types of map systems. Overnight camping field trip required, and local mini-field trip reports. Prerequisite: Credit or registration in GEOL 3307, or permission of instructor. Field trip fee required.

Fee: \$40.00

**GEOL 3170** Intro to Geophysics Laboratory **1 SCH (0-3)**

Structure of the earth, plate tectonics, and sea-floor spreading. Principles of seismology, gravity, heat flow, geomagnetism, and rock magnetism. Prerequisite: registration or credit in GEOL 3370.

**GEOL 3307** Field Geology **3 SCH (3-0)**

Geologic mapping on topographic maps and aerial photographs. Interpretation of field relationships. Basic topographic surveying methods and measurements using the Global Positioning System (GPS). Prerequisite: GEOL 1304/GEOL 1104. Concurrent enrollment in GEOL 3107 recommended.

**GEOL 3370** Introduction to Geophysics **3 SCH (3-0)**

Application of classical physics to the study of the Earth and the solution of problems in Earth sciences. Geomagnetism, the Earth's gravitational field, seismic analysis, sequence stratigraphy, well log interpretation, and applications to petroleum exploration. Prerequisites: GEOL 1303/ GEOL 1103, PHYS 2325/ PHYS 2125, PHYS 2326.

**GEOL 3409** Mineralogy **4 SCH (3-3)**

Morphological crystallography and symmetry concepts. Methods of identification of minerals by their physical and chemical properties. Origin of economic minerals and ore deposits. Geological significance of common rock-forming minerals. One weekend field trip required. Prerequisites: GEOL 1303/GEOL 1103 and 3 hours of chemistry. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

**GEOL 3411 Petrology 4 SCH (3-3)**

Classification and origin of igneous, sedimentary and metamorphic rocks. Laboratory emphasis on identification and interpretation of hand specimens. One weekend field trip required. Field trip fee required. Prerequisite: GEOL 3409. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

**GEOL 3431 Stratigraphy and Sedimentology 4 SCH (3-3)**

Study of the composition, environment, sequence and correlation of stratified rocks. Prerequisites: GEOL 1303/GEOL 1103 and GEOL 1304/GEOL 1104. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

**GEOL 3445 Oceanography 4 SCH (3-3)**

Methods and principles of oceanography. The physical and chemical properties of the seas, life in the sea and a comprehensive treatment of marine geology. Saturday field trips will be arranged. Prerequisites: GEOG 1301/GEOL 1101 or GEOL 1303/GEOL 1103 or GEOL 1301/GEOL 1101. May be used for geography credit.

Fee: \$5.00

**GEOL 3446 Computational Methods in Geosciences 4 SCH (3-3)**

Time series analysis, autocorrelation, cross-correlation, Fourier transform, Z transform, filtering, deconvolution, wave equation migration, forward and inverse problems, finite difference methods, and tomography. Prerequisites: GEOL 3370 / GEOL 3170.

**GEOL 3481 Structural Geology 4 SCH (3-3)**

The inherent and imposed structures in rocks and their modes of formation. Mechanical principles of rock deformation, petrofabrics, regional structural interpretation, theories of mountain building and geotectonics. Prerequisites: GEOL 1303/GEOL 1103 and GEOL 1304/GEOL 1104. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

**GEOL 4107 Applied Geology Lab 1 SCH (0-3)**

Laboratory course to accompany GEOL 4307. Field and laboratory applications of geological concepts in solving geological engineering problems. Study of engineering principles and properties of earth materials. Exploration of engineering design and methods of site investigations. Prerequisite: registration or credit in GEOL 4307.

Fee: \$20.00

**GEOL 4175 Seismology Laboratory 1 SCH (0-3)**

Interpretation of the spatial component of three-dimensional seismic data. Identification of faults and horizons within real-world volumes. Data loading, preparation, and examination, along with correlation of interpretation to geologic well control. Emphasis on the application of seismic interpretation to hydrocarbon exploration. Prerequisite: registration or credit in GEOL 4375.

**GEOL 4307 Applied Geology 3 SCH (3-0)**

Applications of geological concepts in solving geological engineering problems. Study of engineering principles and properties of earth materials. Exploration of engineering design and methods of site investigations. Prerequisites: GEOL 1303, MATH 1316, CHEM 1311/CHEM 1111.

**GEOL 4313 Industry Geotech Training 3 SCH (1-7)**

Application of technology/software, field work, laboratory analysis or other geologic technique(s) during internship experience. Foundation of the course is on the application of theory/practice to develop an internship project that is due at the end of the term with emphasis on career and communication skills. The course may be taken after the completion of a formal internship, or during the practice of one. The writing component for the course is a formal technical report of skills, equipment, and applications of the science that were utilized during the internship. Prerequisites: GEOL 3107, GEOL 3307, GEOL 3411, GEOL 3431, and GEOL 3481 recommended. Field trip may be required. Students not meeting all prerequisites may be recommend by instructor.

**GEOL 4375 Seismology (WI) 3 SCH (3-0)**

Basics of seismology, starting with wave propagation, seismic reflection and refraction. The physics of determining the seismic velocity and anisotropy structure of the Earth. Earthquake generation, post-seismic deformation and creep events, and their relation to faulting and plate tectonics. Prerequisites: GEOL 1303/ GEOL1103, PHYS 2325/ PHYS 2125, PHYS 2326, GEOL 3370.

**GEOL 4395 Special Problems 1-3 SCH (1-3)**

Supervised individual research of a geological problem that meets the needs and interest of the student. May be repeated for a maximum of 3 semester hours credit. Prerequisite: 18 semester hours of geology prior to registration.

**GEOL 4405 Senior Research Project 4 SCH (3-3)**

Collaborative research project involving the student and a geology faculty member, focused on a topic that requires mastery of geologic knowledge appropriate to the student's plans for a professional career or advanced study in the field. Prerequisite: senior standing in geology.

Fee: \$10.00

**GEOL 4425 Hydrogeology 4 SCH (3-3)**

Principles of fluid, mass and energy transport in geologic formations are emphasized to handle human affair problems such as water supply, contamination and energy resources. Prerequisite: GEOL 1303/GEOL 1103 and GEOL 1304/GEOL 1104.

**GEOL 4441** Non-Seismic Geophys. Explor. **4 SCH (3-3)**

Overview of gravity, magnetism, and other geophysical properties applied to exploration. Focus in on acquiring, processing, and interpreting non-seismic geophysical data and on integration of raw data with other geophysical and geologic data. Prerequisites: GEOL 3370/ GEOL 3371; GEOL 3446.

**GEOL 4615** Geology Field Camp (WI) **6 SCH (1-15)**

Geologic field methods and techniques. Includes the use and maintenance of field equipment; measurement, description and interpretation of stratigraphic sections; identification and interpretation of field relationships of various rocks; preparation of geological field reports. Typically scheduled in summer with daily day-long activities; special travel charges may apply. Prerequisites: GEOL 3431 and approval of instructor; GEOL 3307/GEOL 3107; GEOL 3411 and GEOL 3481 recommended.

Fee: \$80.00

## Mathematics (MATH)

**MATH 0302** Developmental Algebra **3 SCH (3-0)**

The mathematic skills necessary for success in college-level mathematics. Topics include real number operations, linear and quadratic equations, graphing linear and nonlinear equations, simplifying polynomial, rational and radical expressions, basic probability and geometry, and mathematical and statistical reasoning. Course does not count toward any degree. Placement based on student ACT/SAT, TSIA and/or placement test scores. Credit/Non-credit.

**MATH 0315** Foundations of Algebra **3 SCH (3-0)**

A study of relations and functions, inequalities, algebraic expressions and equations, with a special emphasis on linear and quadratic expressions and equations. The course is the study of basics concepts necessary for success in MATH 1314 to include rational expressions, equations, functions, graphs, systems of linear equations, problem solving, exponent, and radicals. Corequisite with MATH 1314. Placement based on Multiple Measure Placement.

**MATH 0335** Foundations Contemporary Math **3 SCH (3-0)**

A study of relations, functions, inequalities, algebraic expressions and equations. The course if the study of basic concepts necessary for success in MATH 1334 with an emphasis on logical reasoning, numeracy, probabilistic reasoning, algebraic competence, modeling and interpretation. Corequisite with MATH 1334. Placement based on Multiple Measure Placement.

**MATH 1314** College Algebra **3 SCH (3-0)**

College-level topics in algebra including functions, graphs, variation, piecewise defined functions, equations of lines, elementary curve fitting, quadratic equations and functions, systems of linear and nonlinear equations, composition of functions, inverse functions, exponential and logarithmic functions and applications related to these topics. Prerequisite: Multiple Measure Placement.

**MATH 1316** Trigonometry **3 SCH (3-0)**

Fundamental notions and definitions, functions of angles and inverse trigonometric functions, trigonometric equations, circular measure, law of sine and law of cosine, solution of triangles, applying trigonometric formulae. Required of all engineering students. Prerequisite: Multiple Measure Placement or MATH 1314 (may be taken concurrently).

**MATH 1324** Math for Bus and Econ I **3 SCH (3-0)**

A course designed for students in business administration. Selected topics from finite mathematics including: linear inequalities, vectors, matrices, linear programming and probability. Prerequisite Multiple Measure Placement.

**MATH 1325** Math for Bus and Econ II **3 SCH (3-0)**

Applications of the theory of extrema. Area under a curve and its applications. Introduction to statistical measures. Prerequisite: MATH 1314 or MATH 1324.

Fee: \$5.00

**MATH 1332** Contemporary Mathematics **3 SCH (0-3-0)**

An introduction to several contemporary applications of mathematics for the nonmajor. Topics will vary, but may include: applications of mathematics to management problems, applications of number theory, mathematics for social science, topics in geometry, and introductory data analysis. Prerequisite: Multiple Measure Placement.

**MATH 1342** Elementary Statistical Methods **3 SCH (3-0)**

Elementary description of tools of statistics inference, including empirical and theoretical distributions, probability, sampling, treatment of both continuous and discrete data, correlation, regression, hypothesis testing and applications to practical problems. Prerequisite: Multiple Measure Placement.

Fee: \$5.00

**MATH 1348** Analytic Geometry **3 SCH (3-0)**

Exponentials and logarithms, complex numbers. Polynomials and their zeroes. Equations and their graphs, Cartesian and polar coordinates, lines and linear models, circles and conic sections. Operations with vectors, the dot and cross product. Prerequisites: MATH 1316 or Multiple Measure Placement.

**MATH 1350** Fundamentals of Mathematics I **3 SCH (3-0)**

Problems from number theory, number systems, systems of operations and proportional reasoning. Requires approaching problems from multiple perspectives, drawing connections among those perspectives and strengthening flexibility and fluency in mathematical thinking and communicating. Not applicable for credit in the physical sciences or engineering. Prerequisite: MATH 1314 or higher.

**MATH 1351 Fundamentals of Mathematics II 3 SCH (3-0)**

Problems from probability, statistics, measurement, geometry and spatial thinking. Requires approaching problems from multiple perspectives, drawing connections among those perspectives and strengthening flexibility and fluency in mathematical thinking and communicating. Not applicable for credit in the physical sciences or engineering. Prerequisite: MATH 1350.

**MATH 2412 Precalculus 4 SCH (4-0)**

Study fundamental concepts of algebra, trigonometry, and analytic geometry to prepare for calculus. Explore functions, equations, and their graphs in Cartesian and polar coordinates; analyze polynomials and their zeros; and apply exponential, logarithmic, and trigonometric functions. Solve trigonometric equations, work with inverse trigonometric functions, and use the laws of sines and cosines to solve triangles. Investigate circles, conic sections, complex numbers, and vectors, including dot and cross products. Prerequisite: Placement through Multiple Measures, successful completion of MATH 1314 with a grade of C or better, or qualifying score on the Department of Mathematics placement exam.

**MATH 2413 Calculus I 4 SCH (3-2)**

Limits and continuity. Definition of the derivative of a function and techniques of differentiation. Derivatives of various functions, to include rational, exponential, logarithmic, trigonometric and their inverses. Maximizing or minimizing a function, curve sketching, and rate of change problems; L'Hospital's rule. Introduction to integration, the Fundamental Theorem of Calculus, applications to areas; introduction to numerical integration. Prerequisite: Placement through Multiple Measures, MATH 1348, MATH 2412, or qualifying score on the Department of Mathematics placement exam. Fee: \$15.00

**MATH 2414 Calculus II 4 SCH (3-0-2)**

Continuation of MATH 2413. Integration of logarithmic, exponential, and trigonometric functions. Techniques of integration. Applications of the integral to problems involving volumes, work, arc length, and fluid pressure. Infinite sequences and series, power series expansion of function. Calculus with parametric curves, and polar coordinates. Prerequisite: MATH 2413.

Fee: \$15.00

**MATH 3320 Differential Equations 3 SCH (3-0)**

An introduction to both theoretical and applied aspects of ordinary differential equations. Topics may include: first order differential equations, methods to solve linear second and higher order differential equations, numerical methods, the Laplace transform, and systems of first order differential equations using eigenvalues and eigenvectors. Prerequisite: MATH 2414.

Fee: \$15.00

**MATH 3325 Intro Mathematical Proofs (WI) 3 SCH (3-0)**

Principles and techniques of discovering and writing correct mathematical proofs. Independently prove theorems from various areas in mathematics, which may include topics from logic, the structure of the real number system, number theory, geometry and algebra. Prerequisite: MATH 2413.

**MATH 3352 Applied Fundamentals of Math 3 SCH (3-0)**

Applied projects in selected areas of mathematics, such as number systems, systems of operations, proportional reasoning, probability, statistics, measurement, and geometry. Emphasis on understanding pedagogical content for pre-service teachers in mathematics. Planning, implementing and assessing mathematics activities during a two-week summer camp for area youth. Prerequisite: MATH 2413.

**MATH 3360 Modern Geometry 3 SCH (3-0)**

Historical review of set theory logic and applications in Euclidean Geometry, Hilbert's approach and revision of Euclid's postulates, rewriting of Euclid's fifth postulate, Axiomatic approach to modern Geometry, Foundations of non-Euclidean geometry. Prerequisite: MATH 2413 or Instructor consent.

**MATH 3370 Discrete Mathematics 3 SCH (3-0)**

This course covers many topics in mathematics which are important in computer science. Some of these topics are sets, relations, functions, algorithms, graphs, monoids, lattices, Boolean algebras and graphs. Prerequisite: MATH 2413 or Instructor Consent

Fee: \$5.00

**MATH 3371 Problem Solving with Computers 3 SCH (3-0)**

Brief historical overview of computing and computers; strategies for solving problems by computers; programming in a higher level language. Students will be exposed to problem solving using technology, graphing calculator, and computer algebra system. Prerequisite: MATH 2413 or Instructor consent.

**MATH 3390 Selected Topics in Math 3 SCH (3-0)**

Different topics will be covered at varying times. May be repeated for credit with consent of the instructor. Prerequisite: Instructor consent.

**MATH 3415 Calculus III 4 SCH (3-0-2)**

Continuation of MATH 2414. Vector operations in 2 and 3 dimensions, lines, planes; vector functions, space curves, partial derivatives, curvature; multivariable calculus, optimization, Lagrange multipliers; multiple integral; vector fields, theorems of Green, Gauss and Stokes. Prerequisite: MATH 2414.

Fee: \$15.00

**MATH 4305 Applied Math with Python & ML 3 SCH (3-0)**

Introduction to Python programming and foundational machine learning for mathematics and statistics. Topics include data manipulation and visualization using NumPy, Pandas, and Matplotlib, and implementation of basic algorithms such as regression, classification, and clustering with scikit-learn. Emphasis on hands-on coding and data analysis projects. Prerequisites: MATH 2413.

**MATH 4321 Real Variables 3 SCH (3-0)**

Proofs oriented course. The real number system, its structure and properties. Properties of real functions and sequences, including uniform continuity and the Cauchy criterion. Introduction to the theory of sets. Theory and application of the derivative. Introductory concepts of function spaces, norms and metrics. Prerequisite: 6 semester hours of advanced mathematics, including MATH 3325.

**MATH 4340 Modern Algebra 3 SCH (3-0)**

Properties of the Integers: divisibility, prime factorization and congruences. Integral domains, rings and fields. Groups, permutations and cosets. A historical development of these topics is included. Prerequisite: MATH 3325.

**MATH 4341 Linear Alg and Matrix Theory 3 SCH (3-0)**

Course topics include linear systems, determinants, solution of linear systems, vector spaces and their linear subspaces, representation of linear transformations by matrices, eigenvalues and eigenvectors, special transformations and applications, orthogonality and least squares, symmetric matrices and quadratic forms. Prerequisite: 6 semester hours of advanced mathematics.

Fee: \$15.00

**MATH 4342 Algebraic Structures 3 SCH (3-0)**

An intensive axiomatic study of groups, rings, polynomial rings, fields and modules, along with their principal substructures. Emphasis on classification and structure theorems. Prerequisite: 6 hours of hours of advanced mathematics, including MATH 3325.

**MATH 4351 Mathematical Theory of Games 3 SCH (3-0)**

Introduction to game theory. Topics include: combinatorial and strategic games, backward induction, payoffs, cooperative and non-cooperative games, mixed strategies, equilibria, repeated games and finite automata, common knowledge and incomplete information, the prisoner's dilemma. Selected applications to economics, biology, computer science, and political science. Prerequisite: MATH 2414 or consent of instructor.

**MATH 4370 Vector Analysis 3 SCH (3-0)**

Vector algebra and geometry. Scalar and vector products. Vector functions and motion in polar coordinates. Scalar and vector fields with applications to line and surface integrals. Prerequisites: MATH 3415 and Instructor consent.

**MATH 4371 Laplace Transformation 3 SCH (3-0)**

An introduction to the theory of the Laplace Transformation. Applications to the solution of ordinary and partial differential equations, integral equations, difference equations and integro-differential equations. Exponential of a matrix with applications. An introduction to other types of integral transformations. Prerequisites: MATH 3320 and MATH 3415.

**MATH 4372 Math for Physics and Eng I 3 SCH (3-0)**

Infinite series, matrix methods, vector analysis, applied multivariate calculus and Fourier series. Prerequisites: MATH 3320 and MATH 3415.

**MATH 4373 Application of Matrix Methods 3 SCH (3-0)**

Matrices and their inverses, determinants, eigenvalues and eigenvectors, Jordan canonical forms. Applications to simultaneous linear equations, matrix algebra, and linear differential equations. Numerical applications may be emphasized. Prerequisites: MATH 3320 and MATH 3415.

Fee: \$5.00

**MATH 4374 Numerical Analysis 3 SCH (3-0)**

The mathematical formation of the concepts in numerical analysis. These concepts include the theory of errors, roots of equations, interpolation, linear systems of equations, numerical differentiation and integration and solutions of ordinary differential equations. Prerequisites: MATH 3320 and MATH 3415.

**MATH 4390 Selected Topics in Mathematics 3 SCH (3-0)**

Different topics will be covered at varying times. May be repeated for credit with consent of instructor. Prerequisite: 3 semester hours of advanced mathematics or consent of instructor.

**MATH 4399 Capstone Experience in Math 3 SCH (3-0)**

Designed to integrate mathematical standards and skills of mathematics majors. Students will demonstrate their ability to organize and synthesize mathematical knowledge; and design, implement, and present an advanced project in mathematics or mathematics education. Prerequisite: Senior standing in mathematics.

## Non-Course Based Option Courses (NCBM)

**NCBM 0101 Non-Course Based Option Math 1 SCH (0-2)**

A non-course-based option to accelerate developmental math students and support success in college algebra. Covers basic academic skills to support students in developing skills, strategies, and reasoning needed to succeed in College Algebra, including appropriate use of technology. Students must be concurrently registered in a gateway math course (MATH 1314). Placement is based on multiple measures placement. Credit/Noncredit.

**NCBM 0102 BASE NCBO Developmental Math 1 SCH (0-2)**

A basic academic skills education non-course based option to support students in developing skills, strategies, and reasoning needed to succeed in mathematics, including communication and appropriate use of technology. Students must be concurrently registered in MATH#1324, MATH#1334, or STAT#1342. Placement is based on mathematics TSIA scores and multiple measures (holistic) assessment. Credit/Noncredit.

## Physics (PHYS)

### **PHYS 1101** Coll Physics I Laboratory **1 SCH (0-4)**

A laboratory course to accompany PHYS 1301. Prerequisite: credit or registration in PHYS 1301.

Fee: \$5.00

### **PHYS 1102** College Physics II Lab **1 SCH (0-4)**

A laboratory course to accompany PHYS 1302. Prerequisite: credit or registration in PHYS 1302.

Fee: \$5.00

### **PHYS 1301** College Physics I **3 SCH (3-0)**

A trigonometry-based introduction to physics. Topics include kinematics, vector analysis, force dynamics, equilibrium, work, energy, momentum, collisions, fluid dynamics, and thermal physics. Prior knowledge of physics (one year of high school physics; otherwise PHYS 1373 is recommended) is assumed. Prerequisites: MATH 1314 and MATH 1316. Concurrent enrollment in PHYS 1101 is recommended.

### **PHYS 1302** College Physics II **3 SCH (3-0)**

A continuation of PHYS 1301. Topics include periodic motion, sound, electric force, electric current, resistance, electric circuits, magnetism, electromagnetic induction, AC circuits, light and optics. Prerequisite: PHYS 1301 and PHYS 1101. Concurrent enrollment in PHYS 1102 is recommended.

### **PHYS 1305** Elementary Physics **3 SCH (3-2)**

A survey of the most basic concepts of physics. Topics include scientific measurements, motion, momentum, energy, gravitation, matter, heat, electricity, magnetism, sound, light, atomic structure and nuclear energy. Prerequisite: MATH 1314.

Fee: \$5.00

### **PHYS 1471** Acoustical Foundations of Music **4 SCH (3-2)**

A general introduction and survey of the physical and acoustical foundations of music. Topics include the fundamental physics relevant to music, the reception of musical sound, intervals, scales, tuning, temperament, auditorium and room acoustics and the production of sounds by musical instruments including electronic.

Fee: \$5.00

### **PHYS 2125** University Physics I Lab **1 SCH (0-4)**

A laboratory course to accompany PHYS 2325. Prerequisite: credit or registration in PHYS 2325.

Fee: \$5.00

### **PHYS 2126** University Physics II Lab **1 SCH (0-4)**

A laboratory course to accompany PHYS 2326. Prerequisite: credit or registration in PHYS 2326.

Fee: \$5.00

### **PHYS 2325** University Physics I **3 SCH (3-0)**

A calculus-based introduction to physics. Topics include kinematics, vector analysis, force dynamics, equilibrium, work, energy, momentum, collisions, fluid dynamics, and thermal physics. Prior knowledge of physics (one year of high school physics; otherwise PHYS 1373 is recommended) is assumed. Prerequisite: credit or registration in MATH 2413 or equivalent. Concurrent enrollment in PHYS 2125 is recommended.

### **PHYS 2326** University Physics II **3 SCH (3-0)**

A continuation of PHYS 2325. Topics include periodic motion, sound, electric force, electric current, resistance, electric circuits, magnetism, electromagnetic induction, light, optics and modern physics. Prerequisite: PHYS 2325 and PHYS 2125 or PHYS 1302 and PHYS 1102; credit or registration in MATH 2414 or equivalent or MATH 3415. Concurrent enrollment in PHYS 2126 is recommended.

### **PHYS 3310** Advanced Physics Laboratory **3 SCH (1-4)**

A laboratory course focusing on advanced techniques and experiments drawn from the full range of physics classes. The student will understand the role of experimental design, advanced data analysis and reduction and the use of computers while investigating physical phenomena. Prerequisite: credit or registration in PHYS 3343.

### **PHYS 3313** Mechanics I **3 SCH (3-0)**

A mathematical treatment of the fundamentals of classical mechanics. Topics include particle dynamics in one, two and three dimensions; conservation laws; dynamics of a system of particles; motion of rigid bodies; central force problems; accelerating coordinate systems; gravitation; Lagrange's equations and Hamilton's equations. Prerequisites: PHYS 2326/PHYS 2126; credit or registration in either MATH 3320 or MATH 3415.

### **PHYS 3323** Electromagnetic Field Theory **3 SCH (3-0)**

Electrostatics; Laplace's Equation; the theory of dielectrics; magnetostatics; electromagnetic induction; magnetic fields of currents; Maxwell's equations. Prerequisites: PHYS 2326/PHYS 2126; credit or registration in MATH 3320 or MATH 3415 or equivalent.

### **PHYS 3333** Thermodynamics **3 SCH (3-0)**

Equations of state, ideal gases, first and second laws of thermodynamics, entropy and statistical methods. Prerequisites: PHYS 2326 and 2126; credit or registration in MATH 3415 or equivalent.

**PHYS 3343 Modern Physics I 3 SCH (3-0)**

An introduction to special relativity and elementary quantum mechanics. Topics include space-time, relativistic energy and momentum, the uncertainty principle, Schrodinger's equation, observables and operators, bound states, potential barriers and the hydrogen atom. Prerequisites: PHYS 2326 and 2126; credit or registration in either MATH 3320 or MATH 3415 or equivalent.

**PHYS 4191 Physics Research Project 1 SCH (1)**

Literature survey and preparation for, and initiation of, a research project agreed to between the student and a faculty advisor, to be completed and reported on in the Research Seminar course. Prerequisite: PHYS 3343.

**PHYS 4192 Physics Research Seminar (WI) 1 SCH (1)**

An experimental or theoretical project, begun in the Research Project course, will be concluded by the student and the results reported in a seminar. Students who have not yet taken the ETC major field test in physics are required to do so while enrolled in Seminar. Prerequisite: PHYS 4191.

**PHYS 4303 Math Methods for Physicists 3 SCH (0-3)**

Mathematical techniques from the following areas: infinite series, integral transforming, applications of complex variables; vectors, matrices and tensors, special functions, partial differential equations, Greens' functions, perturbation theory, integral equations, calculus of variations and groups and group representations. Prerequisite: credit or registration in MATH 3320.

**PHYS 4323 Optics 3 SCH (0-3)**

A mathematical treatment of the modern theory of optics. Topics include Huygen's principle as applied to geometric optics, interference, diffraction, polarization, crystal optics, electromagnetic theory of light, the interaction of light with matter and quantum optics. Prerequisites: PHYS 3323; MATH 3415 or MATH 3320.

**PHYS 4353 Quantum Physics 3 SCH (0-3)**

The Schrodinger equation; one dimensional systems; the Heisenberg uncertainty principle; magnetic moments and angular momentum; two and three dimensional systems; approximation methods; scattering theory. Prerequisites: PHYS 3343; credit or registration in either MATH 3320 or MATH 3415 or equivalent.

**PHYS 4360 Nuclear Physics 3 SCH (3-0)**

A study of nuclear phenomena and properties including mass, stability, magnetic moment, radioactive decay processes and nuclear reactions. The application of nuclear principles to other fields such as astronomy, engineering, manufacturing and medicine. Prerequisites: PHYS 3343; credit or registration in both PHYS 4353 and either MATH 3320 or MATH 3415.

**PHYS 4383 Computational Physics 3 SCH (3-0)**

An introduction to the methods and algorithms used in solving physical problems with computers, and computer-related limitations on such solutions. Prerequisites: knowledge of the C programming language; credit or registration in MATH 3415 or 3320.

**PHYS 4390 Sel Topics in Modern Physics 3 SCH (3-0)**

A detailed study of one or more important physical discoveries, developments and/or theories. Course may be repeated for credit. Prerequisite: senior standing.

## Statistics (STAT)

**STAT 4301 Biostatistics 3 SCH (3-0)**

For students in biology, health sciences, human sciences, and wildlife science. Descriptive and inferential statistics, basic probability concepts, probability distributions, estimation, hypothesis testing, correlation, simple linear regression, principles of epidemiology, statistical vs. clinical significance, and quasi-statistical methods. Prerequisite: MATH 1314.

Fee: \$15.00

**STAT 4303 Statistical Methods 3 SCH (3-0)**

Calculus-based probability, discrete and continuous random variables, joint distributions, sampling distributions, the central limit theorem, descriptive statistics, interval estimates, hypothesis tests, ANOVA, correlation, and simple regression. Prerequisite: MATH 2414.

Fee: \$15.00

**STAT 4350 Probability 3 SCH (3-0)**

Sample spaces, combinatorics, independence, conditional probability and Bayes' rule. Discrete and continuous probability distributions, Chebychev's inequality and limit theorems. Prerequisite: MATH 2414.

**STAT 4351 Math Theory of Statistics 3 SCH (3-0)**

Sampling distributions, estimation properties and methods, testing hypothesis, power of tests and likelihood ratios. Prerequisites: STAT 4350 or the equivalent and 3 semester hours of advanced mathematics.

**STAT 4390 Selected Topics in Statistics 3 SCH (3-0)**

Topics in statistics not adequately covered in regular courses. This course may be repeated for credit as topic changes. Prerequisite: 3 semester hours of advanced mathematics or statistics.

## Majors

- Chemistry - Biochemistry - Minor in Biology - Certified by the American Chemical Society, B.S.
- Chemistry - Certified by the American Chemical Society, B.S.

- Chemistry-Pre-Health-Minor in Biology, B.S.
- Mathematics - Teaching Certification, B.S.
- Mathematics, B.A.
- Mathematics, B.S.
- Physics, B.S.

## Minors

- Chemistry, Minor
- Geographic Information Systems, Minor
- Mathematics, Minor
- Physics, Minor

## Academic Certificates

- Computational Chemistry and Data Science, Academic Certificate
- Forensic Science, Academic Certificate
- Geographic Information Systems, Academic Certificate
- Green Chemistry and Environmental Solutions, Academic Certificate
- Industrial Chemistry and Process Analytics, Academic Certificate
- Medicinal and Pharmaceutical Chemistry, Academic Certificate
- Nano Materials Science and Engineering, Academic Certificate

## Planned Course Offerings

This section provides a comprehensive list of courses offered by the School of Mathematics and Physical Sciences, along with a three-year schedule indicating when each course is expected to be available. Please note that course offerings and scheduling are subject to change based on faculty availability and student demand. It is recommended that students consult with their academic advisor to plan their course schedule accordingly.

### Astronomy (ASTR)

| Course    | Fall 2026 | Spring 2027 | Fall 2027 | Spring 2028 | Fall 2028 | Spring 2029 |
|-----------|-----------|-------------|-----------|-------------|-----------|-------------|
| ASTR 1103 |           | X           |           | X           |           | X           |
| ASTR 1104 | X         |             | X         |             | X         |             |
| ASTR 1303 |           | X           |           | X           |           | X           |
| ASTR 1304 | X         |             | X         |             | X         |             |

### Chemistry (CHEM)

| Course    | Fall 2026 | Spring 2027 | Fall 2027 | Spring 2028 | Fall 2028 | Spring 2029 |
|-----------|-----------|-------------|-----------|-------------|-----------|-------------|
| CHEM 1111 | X         | X           | X         | X           | X         | X           |
| CHEM 1112 | X         | X           | X         | X           | X         | X           |
| CHEM 1311 | X         | X           | X         | X           | X         | X           |
| CHEM 1312 | X         | X           | X         | X           | X         | X           |
| CHEM 1405 |           | X           |           | X           |           | X           |
| CHEM 2401 | X         |             | X         |             |           |             |
| CHEM 2421 |           | X           |           | X           |           | X           |
| CHEM 3123 | X         | X           | X         | X           | X         | X           |
| CHEM 3125 | X         | X           | X         | X           | X         | X           |
| CHEM 3181 |           | X           |           | X           |           | X           |
| CHEM 3323 | X         | X           | X         | X           | X         | X           |
| CHEM 3325 | X         | X           | X         | X           | X         | X           |
| CHEM 3331 | X         |             | X         |             | X         |             |
| CHEM 3332 |           | X           |           | X           |           | X           |
| CHEM 3385 |           | X           |           | X           |           | X           |

|           |   |   |   |   |   |   |
|-----------|---|---|---|---|---|---|
| CHEM 4111 | X |   | X |   |   | X |
| CHEM 4131 | X |   |   |   |   |   |
| CHEM 4132 |   | X |   |   |   |   |
| CHEM 4141 | X |   | X |   |   |   |
| CHEM 4181 |   | X |   | X |   | X |
| CHEM 4303 | X |   |   |   |   |   |
| CHEM 4311 | X |   | X |   |   | X |
| CHEM 4313 |   | X |   |   |   |   |
| CHEM 4341 | X | X | X | X | X | X |
| CHEM 4342 |   | X |   | X |   | X |
| CHEM 4421 | X |   | X |   | X |   |
| CHEM 4401 |   | X |   | X |   | X |
| CHEM 4421 | X |   | X |   | X |   |
| CHEM 4401 |   | X |   | X |   | X |
| CHEM 4421 |   | X |   |   |   |   |

## Geography (GEOG)

| Course    | Fall 2026 | Spring 2027 | Fall 2027 | Spring 2028 | Fall 2028 | Spring 2029 |
|-----------|-----------|-------------|-----------|-------------|-----------|-------------|
| GEOG 1301 | X         | X           | X         | X           | X         | X           |
| GEOG 1303 | X         | X           | X         | X           | X         | X           |
| GEOG 2472 | X         | X           | X         | X           | X         | X           |
| GEOG 3305 | X         |             | X         |             |           |             |
| GEOG 3421 |           |             | X         |             | X         |             |
| GEOG 3450 |           | X           |           |             |           |             |
| GEOG 3460 |           |             |           | X           |           | X           |
| GEOG 4429 |           | X           |           | X           |           | X           |
| GEOG 4435 | X         |             | X         |             | X         |             |

## Geology (GEOL)

| Course    | Fall 2026 | Spring 2027 | Fall 2027 | Spring 2028 | Fall 2028 | Spring 2029 |
|-----------|-----------|-------------|-----------|-------------|-----------|-------------|
| GEOL 1101 | X         | X           | X         | X           | X         | X           |
| GEOL 1102 | X         |             | X         |             |           |             |
| GEOL 1103 | X         | X           | X         | X           | X         | X           |
| GEOL 1104 |           | X           |           | X           |           | X           |
| GEOL 1301 | X         | X           | X         | X           | X         | X           |
| GEOL 1302 | X         | X           | X         | X           | X         | X           |
| GEOL 1303 | X         | X           | X         | X           | X         | X           |
| GEOL 1304 |           | X           |           | X           |           | X           |
| GEOL 2376 | X         | X           | X         | X           | X         | X           |
| GEOL 3107 | X         |             | X         |             |           |             |
| GEOL 3170 | X         |             | X         |             |           |             |
| GEOL 3307 | X         |             | X         |             |           |             |
| GEOL 3370 | X         |             | X         |             |           |             |
| GEOL 3409 | X         |             | X         |             |           |             |
| GEOL 3411 |           | X           |           | X           |           |             |
| GEOL 3431 | X         |             | X         |             | X         |             |
| GEOL 3445 | X         |             | X         |             |           |             |
| GEOL 3446 | X         |             | X         |             | X         |             |
| GEOL 3481 |           | X           |           | X           |           |             |

|                        |   |   |   |   |  |   |
|------------------------|---|---|---|---|--|---|
| GEOL 4107              |   |   |   | X |  | X |
| GEOL 4175              |   |   |   | X |  | X |
| GEOL 4307              |   |   |   | X |  | X |
| GEOL 4313              | X |   | X |   |  |   |
| GEOL 4375              |   |   |   | X |  | X |
| GEOL 4395              | X |   | X |   |  |   |
| GEOL 4405              |   |   | X |   |  | X |
| GEOL 4425              |   | X |   | X |  | X |
| GEOL 4441              |   | X |   |   |  |   |
| GEOL 4615 <sup>1</sup> |   |   |   |   |  |   |

## Mathematics (MATH)

| Course                 | Fall 2026 | Spring 2027 | Fall 2027 | Spring 2028 | Fall 2028 | Spring 2029 |
|------------------------|-----------|-------------|-----------|-------------|-----------|-------------|
| MATH 0315              | X         | X           | X         | X           | X         | X           |
| MATH 0335              | X         | X           | X         | X           | X         | X           |
| MATH 1314              | X         | X           | X         | X           | X         | X           |
| MATH 1316              | X         | X           | X         | X           | X         | X           |
| MATH 1324              | X         | X           | X         | X           | X         | X           |
| MATH 1325              | X         | X           | X         | X           | X         | X           |
| MATH 1332              | X         | X           | X         | X           | X         | X           |
| MATH 1342              | X         | X           | X         | X           | X         | X           |
| MATH 1348              | X         | X           | X         | X           | X         | X           |
| MATH 1350              | X         |             | X         |             | X         |             |
| MATH 1351              |           | X           |           | X           |           | X           |
| MATH 2413              | X         | X           | X         | X           | X         | X           |
| MATH 2414              | X         | X           | X         | X           | X         | X           |
| MATH 3320              | X         | X           | X         | X           | X         | X           |
| MATH 3325              | X         |             | X         |             | X         |             |
| MATH 3352 <sup>1</sup> |           |             |           |             |           |             |
| MATH 3360              | X         |             | X         |             | X         |             |
| MATH 3370              |           | X           |           | X           |           | X           |
| MATH 3371              | X         |             | X         |             | X         |             |
| MATH 3390              |           |             |           | X           |           | X           |
| MATH 3415              | X         | X           | X         | X           | X         | X           |
| MATH 4321              |           | X           |           | X           |           | X           |
| MATH 4340              |           | X           |           | X           |           | X           |
| MATH 4341              | X         | X           | X         | X           | X         | X           |
| MATH 4342              |           |             | X         |             | X         |             |
| MATH 4351              |           | X           |           | X           |           | X           |
| MATH 4370              |           |             | X         |             | X         |             |
| MATH 4371              |           |             |           | X           |           | X           |
| MATH 4372              |           |             |           | X           |           | X           |
| MATH 4373              |           | X           |           | X           |           | X           |
| MATH 4374              |           | X           |           | X           |           | X           |
| MATH 4390              |           |             |           | X           |           | X           |
| MATH 4399              |           |             |           | X           |           | X           |

## Non-Course Based Option (NCBM)

| Course    | Fall 2026 | Spring 2027 | Fall 2027 | Spring 2028 | Fall 2028 | Spring 2029 |
|-----------|-----------|-------------|-----------|-------------|-----------|-------------|
| NCBM 0101 | X         | X           | X         | X           | X         | X           |
| NCBM 0102 | X         | X           | X         | X           | X         | X           |

## Physics (PHYS)

| Course    | Fall 2026 | Spring 2027 | Fall 2027 | Spring 2028 | Fall 2028 | Spring 2029 |
|-----------|-----------|-------------|-----------|-------------|-----------|-------------|
| PHYS 1101 | X         | X           | X         | X           | X         | X           |
| PHYS 1102 | X         | X           | X         | X           | X         | X           |
| PHYS 1301 | X         | X           | X         | X           | X         | X           |
| PHYS 1302 | X         | X           | X         | X           | X         | X           |
| PHYS 1305 | X         | X           | X         | X           | X         | X           |
| PHYS 1471 | X         | X           | X         | X           | X         | X           |
| PHYS 2125 | X         | X           | X         | X           | X         | X           |
| PHYS 2126 | X         | X           | X         | X           | X         | X           |
| PHYS 2325 | X         | X           | X         | X           | X         | X           |
| PHYS 2326 | X         | X           | X         | X           | X         | X           |
| PHYS 3310 |           | X           |           | X           |           | X           |
| PHYS 3313 | X         |             | X         |             | X         |             |
| PHYS 3323 | X         |             | X         |             | X         |             |
| PHYS 3333 | X         |             | X         |             | X         |             |
| PHYS 3343 | X         |             | X         |             | X         |             |
| PHYS 4191 | X         |             | X         |             | X         |             |
| PHYS 4192 |           | X           |           | X           |           | X           |
| PHYS 4303 |           | X           |           | X           |           | X           |
| PHYS 4323 | X         |             | X         |             |           |             |
| PHYS 4353 | X         |             | X         |             | X         |             |
| PHYS 4360 |           | X           |           | X           |           | X           |
| PHYS 4383 |           | X           |           |             |           |             |
| PHYS 4390 | X         | X           | X         | X           | X         | X           |

## Statistics (STAT)

| Course    | Fall 2026 | Spring 2027 | Fall 2027 | Spring 2028 | Fall 2028 | Spring 2029 |
|-----------|-----------|-------------|-----------|-------------|-----------|-------------|
| STAT 4301 | X         | X           | X         | X           | X         | X           |
| STAT 4303 | X         | X           | X         | X           | X         | X           |
| STAT 4350 | X         |             | X         |             | X         |             |
| STAT 4351 |           | X           |           | X           |           | X           |
| STAT 4390 | X         |             | X         |             | X         |             |

## Marketable Skills

Texas A&M University-Kingsville is committed to preparing students for success beyond the classroom by helping them develop marketable skills. These are the interpersonal, cognitive, and applied abilities that today's employers value most. Our academic programs are designed to help students build these essential competencies through a blend of academic coursework, hands-on learning, research opportunities, internships, and extracurricular involvement.

Below are the marketable skills provided by each of the school's academic programs.

## Chemistry

- Effective communication
- Critical thinking
- Empirical and quantitative skills
- Personal and social responsibility
- Teamwork and leadership skills
- Technical skills
- Problem-solving and decision-making skills

## Mathematics

- Analytical and logical thinking and reasoning
- Problem-solving
- Computer and calculator proficiency
- Mathematical writing
- Data collection, analysis, and interpretation
- Attention to detail

## Physics

- Effective communication
- Critical thinking
- Empirical and quantitative
- Teamwork