

- become a professional/industrial chemist physicist, or
- continue study in chemistry or physics at the graduate level.

Chemistry

Students pursuing a major in Chemistry must complete Math 211, 212; Physics 231, 232, and meet the following requirements in Chemistry:

- A. CHE 111, 112, 211, 221, 314, 315, 317, 318, 319, 324, 325, 327, 335, 498
- B. Research, 3 hours from: 424 or 425
- C. One of: 405, 430, 435

Leading to the Bachelor of Science in Medical Technology

- A. Chemistry 111, 112, 211-21, 314-15, 319, 324-25
- B. Biology 112, 211, 221, 222, 315, 316, 320
- C. Physics 213-214 or 231-232
- D. Computer Science (3 hours) and MAT 111
or preferably MAT 211
- E. A minimum of 33 hours of Medical Technology at an affiliated hospital as
the fourth year of study.

- A. Chemistry 111, 112, 211, 221, 314, 315, 324, 325, 317, 318, 327, 319, 335 34
- B. Physics 231, 232, 311, 313, 314; 325 or 420; 430 26
- C. PHY 424 or CHE 424; PHY 498 or CHE 498; Upper level PHY or CHE 6
- D. Math 211, 212, 213, 314 15
- E. English 111, 112; 201 or 202 9

Students admitted into this program will be selected from those entering with an above-average preparation in high school science and mathematics, or from those who

is given by the faculty of the Department of Chemistry and Physics to the student who presents the best research paper of the year. The research must have been an original piece of work and must have been presented at a state, regional, or national professional chemistry meeting prior to graduation.

, given to encourage and sustain interest in the sciences, is awarded in recognition of outstanding scholastic achievement in Freshman Chemistry.

. The Chemistry Department selects a freshman chemistry major or minor to receive this award based on outstanding scholastic achievement, financial need, Christian service, and school spirit.

Course Offerings in Chemistry (CHE)

()-Hours Credit; F-Fall; W-Winter; S-Spring; Su-Summer

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A survey of proper safety policies and procedures associated with the use of hazardous chemicals. Topics include safety awareness, routes of chemicals into the body, personal safety apparatus and its use, identification and types of chemical hazards, literature on chemical hazards, and proper ways to label, handle, store, and dispose of hazardous chemicals.

See PHY 301 for course description.

Prerequisite: CHE 112; Corequisite: CHE 324.

An introduction to the compounds of carbon, with emphasis on the relationship between structure and properties. Applications of bonding theory, reaction mechanism, and stereochemistry are included. Some functional groups containing halogen and oxygen will be examined in detail. Three lectures per week.

Prerequisite: CHE 314; Corequisite: CHE 325.

An in-depth examination of the common oxygen and nitrogen functional groups with respect to structure and chemistry. Continued application of basic theory is included. Heterocyclic and biomolecules will also be examined. Three lectures per week.

Prerequisites: CHE 211, MAT 212, and PHY 232.

An introduction to the application of physical techniques to chemical systems with emphasis on thermodynamics. The laws of thermodynamics will be derived and applied to phase and chemical equilibria, electrochemical cells, and surface phenomena. Three lectures.

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Prerequisite: CHE 317.

A continuation of CHE 317 with emphasis on dynamics and quantum chemistry. Dynamics include kinetics, mechanisms, and photochemistry. Quantum chemistry includes atomic and molecular electronic structure and their application to spectroscopy. Three lectures.

Prerequisite: CHE 315, CHE 325, and BIO 112.

An introduction to the organic chemistry of living systems. Topics include structure and function of proteins, enzymic control of chemical reactions, catabolism, anabolism, bioenergetics, biosynthesis, and molecular biology. Three lectures and one 3-hour lab per week.

Corequisite: CHE 314.

An introduction to the basic techniques for the physical characterization and isolation of organic compounds. Use of spectrometric methods as applied to the determination of structure is included, as are some synthetic methods. Two three-hour laboratory periods per week.

Prerequisite: CHE 314 and CHE 324; Corequisite: CHE 315.

Application of laboratory techniques in synthesis and characterization of organic and inorganic compounds. Two three-hour laboratory periods per week.

Corequisite: CHE 318.

The application of physical methods in the study of chemical compounds. Two three-hour laboratory periods per week.

Prerequisite: CHE 315.

An introduction to inorganic compounds with an emphasis on coordination, bioinorganic, nuclear, and organometallic chemistry. The relationships between structure, physical properties and reactivity will be examined in detail.

Prerequisite: CHE 315.

A study of the rapid changes in the earth's atmosphere, water and soil caused by the activities of humankind. Attention will be given to the ozone layer, air quality and water cycles at the surface of the earth. The vectors, fate, and treatment/removal strategies for organic and heavy metal pollutants will be discussed in depth. Three lectures and one 3-hour lab per week.

The student's knowledge is integrated by application of a simple piece of original work.

Prerequisite: 20 hours of chemistry and a junior/senior standing. Each course will be three hours per week per credit hour.

Prerequisite: CHE 211. Prerequisite or Corequisite: CHE 318 and 335.

A theoretical treatment of fundamental inorganic topics such as chemical bonding, periodic relationships, stereochemistry of inorganic complexes, acids and bases, and physical properties of inorganic compounds. Three lectures and one 3 hour lab per week.

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Prerequisite: CHE 315.

An extensive treatment of selected topics including reaction mechanisms, stereochemistry, heterocyclic chemistry, and molecular rearrangements. Three lectures and one three hour lab per week.

Prerequisite: 20 hours of chemistry and junior/senior standing.

Skills in scientific and technical presentations, written and oral, will be polished. To be used at the discretion of the department for majors and minors only.

Medical Technology

Hospital-in-Residence Curriculum (Course numbers are Union University numbers)

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The chemical analysis by manual and automated methods of various body fluids (blood, urine, CSF) and the study of their relationship to disease states. Includes instruction in theory and practical laboratory methods.

A study of basic electricity and electronics and the principles, use, and care of instruments found in up-to-date laboratories.

Application of theory to technical performance in hematological procedures which aid in the classification of anemias, leukemias, and other red and white blood cell abnor-

malities. Identification of factors involved in bleeding disorders, patient response to therapeutic agents, and principles and practice of quality control and instrumentation.

A lecture and lab course covering the role of microorganisms as they cause disease in man. Methods employed in the identification of bacteria, fungi, viruses, and rickettsiae. Basic principles of the pathogenesis of infection are covered with particular emphasis on theory and techniques for lab diagnosis.

A lecture and lab course in immunology, which presents the basic principles of immunity as related to pathogenic organisms and the more complex reactions of the host. Laboratory methods of demonstrating reactions between antigens and antibodies are considered. Use of these reactions as a serodiagnostic tool is presented.

Includes selection, testing and bleeding of donors, identification of blood group antigens and antibodies, procedures employed in providing compatible blood for patients, and principles and procedures used in blood component therapy. Lecture and lab exercises are employed.

A study of parasites of medical significance, both indigenous and foreign, with particular emphasis on life cycles and identification, is presented through lectures and laboratory practice.

A lecture and lab course which includes the gross, physical, microscopic, and chemical analysis of urine.

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Basic understanding of altered physiology in disease; correlation between laboratory test results and anatomical/physiological changes.

- B. Physics 112, 231-232, 311, 310 or 301, + 2 hours PHY elective 24
- C. Biology 8 hours 8

- A. Complete the requirements shown above for the Physics major.
- B. Professional Education minor: EDU 150, 250, 326, 418, 433, PSY 213, 318, SE 225.
- C. Complete the applicable portions of the Praxis II.
- D. For additional information, see the Director of Teacher Education.

Physics 231-232, 311, + 10 hours of Physics electives except PHY 111, 112, 301, 310

Course Offerings in Physics (PHY)

(-)-Hours Credit; F-Fall; W-Winter; S-Spring; Su-Summer

An introduction to physics and chemistry for non-science majors designed to acquaint the student with the historical, philosophical, and social significance of the physical sciences. Exercises are indicative of various scientific methods. Knowledge of basic algebra is assumed. Science credit will not be given after completion of a course in either CHE or PHY. Three lectures, one 2-hour laboratory per week.

Prerequisite: PHY 111. Reciprocal credit: GEO 112.

An overview of earth science and astronomy with their nature, history, divisions, and relation to other sciences being discussed. The physical laws of nature will be examined as they apply to physical geography, meteorology, and astronomy. Three lectures & one 2-hour laboratory per week.

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Prerequisite: MAT 111-2.

The first semester involves the study of classical mechanics, wave motion, fluid flow, sound, temperature, and heat. The second involves the study of electricity, magnetism, light, optics, and modern physics. Three lectures and one 3 hour lab per week.

Pre- or Corequisite: MAT 211-2.

The first semester involves the study of classical mechanics, wave motion, fluid flow and sound. The second involves the study of temperature and heat, electricity, magnetism, light, optics, and modern physics. Four lectures and one laboratory per week.

Prerequisite: PHY 111-2.

The course approaches the study of science from a historical and philosophical perspective in an interdisciplinary manner, exploring the complementarity of the physical and biological sciences, while addressing relationships to other disciplines such as art, religion, and politics. Examines the role of science in global issues—environment, health, energy—and life issues. Three lecture & 2 laboratory hours per week.

Prerequisite: PHY 111.

A non-technical course for the general student presenting a broad view of energy and its relationship to man and the environment. Topics include past and future demands, energy sources, storage and transportation of energy, environmental considerations, conservation, politics, economics, and national policy. Three lecture & 3 laboratory hours per week. Laboratories include tours.

Prerequisite: MAT 212 & PHY 232.

An introduction to special relativity, quantum mechanics, atomic, and nuclear physics. The laboratory involves investigations in radioactivity, as well as performing some of the classic experiments of modern physics. Three lectures, one 3-hour lab per week.

Prerequisite: PHY 232 & MAT 212.

An introduction to the rectilinear and curvilinear dynamics of particles and rigid bodies. Both Lagrangian and Hamiltonian formulations of mechanics will be developed and applied.

Prerequisite: MAT 212 & PHY 232.

A study of electric and magnetic fields both in media and in a vacuum. Maxwell's equations are used to determine the electromagnetic fields produced by a variety of charge and current distributions.

Prerequisite: MAT 212. Reciprocal credit: EGR 262.

An introduction to the field of electronics beginning with DC and AC circuit theory, and continuing through the semiconductor devices. Digital electronics are also introduced. Three lectures and one 3-hour lab per week.

Prerequisites: MAT 212 & PHY 232.

An intermediate survey of heat and thermodynamics including the concepts of temperature and heat, the laws of thermodynamics, thermodynamics potentials, the Maxwell relations and statistical methods applied to the thermodynamics of various states of matter, including gases, liquids, and quantum fluids.

Prerequisites: PHY 311 & MAT 314.

Fundamental principles of quantum mechanics, methods of calculation, and solutions to Schrodinger's equation. Applications to atomic, molecular, and nuclear physics with an introduction to operator notation. Three lecture hours per week.

Prerequisite: PHY 311.

The student's knowledge is integrated by application of a simple piece of original work to include a literature search and summary paper on a topic of current interest in physics. Under the supervision of a faculty member, this work may be done off site at a national laboratory or comparable research facility.

Prerequisite: PHY 311 & MAT 213.

Introduction to modern experimentation, research, data acquisition and analysis. The theory, practice and reporting of research in a scientific format is demonstrated through experiments in atomic, nuclear, solid state, thermodynamics, and optics. One lecture & four laboratory hours per week.

Prerequisite: 20 hours of physics and junior/senior standing.

Skills in scientific and technical presentations, written and oral, will be polished. To be used at the discretion of the department for majors/minors only.

