
DIVISION OF NATURAL SCIENCE AND MATHEMATICS

Deborah G. Ziegler, *Chair*

The Departments of Biology, Chemistry, General Science, Mathematics, Physical Science, and Physics comprise the Division of Natural Science and Mathematics.

Bachelor of Arts Degree: *Major*—Biology (general, predoctoral, premedical, or preveterinary medicine emphasis)

Bachelor of Science Degree: *Majors*—Biology (general, predoctoral, premedical, or preveterinary medicine emphasis), Mathematics

Associate of Science Degree: Emphases in the following fields of study: Prechemistry, Predental Hygiene, Preengineering, Premedical Technology, Prepharmacy

Minors: Biology, Chemistry, Mathematics, Physics

Biology, Mathematics, and Unified Science Certifications: Offers courses leading to certification in biology (grades 9-12), in mathematics (grades 9-12), and in unified science with biology endorsement (grades 9-12) in secondary education under the Bachelor of Science in Education degree (see Division of Education for details)

Goals

To provide:

- 1) All students with a basic understanding of scientific realities and to present a survey of the fundamentals in the various sciences.
- 2) The nonscience students with introductory courses that give a background in particular sciences.
- 3) Undergraduate students with a strong foundation for graduate study.
- 4) Students in the two-year programs with advanced courses, to prepare them for the majors that they will complete at another institution.
- 5) Those seeking employment in a related vocation with the needed specialized knowledge about science.

Requirements for BA or BS Degree with Major in Biology

NOTE: *To students with interest in predoctoral, premedical, or preveterinary medicine:* The BA or BS degree in biology will meet the majority of requirements for professional schools. However, because requirements vary from one professional school to another, preprofessional students should work closely with their advisers and specify the particular professional school to which they plan to make application.

- 1) Complete the campuswide General Education Requirements (and the language requirement if seeking the BA) and Graduation Requirements (see **Academic Policies** for both).

NOTE: Biology majors must earn a grade of C or better in MTH 143, 153, or 185 to fulfill the mathematics general education requirement.

- 2) Pass each of the Support Course Requirements and each of the Major Course Requirements listed below with a grade of C or better.

SUPPORT COURSE REQUIREMENTS: 32-33 hours

CHM 135	College Chemistry I	MTH 127	Elementary Statistics
CHM 145	College Chemistry II	MTH 185	Analytic Geometry & Calculus I
CHM 335	Organic Chemistry I	PHY 125	Engineering Physics I <u>or</u>
CHM 345	Organic Chemistry II	PHY 214	General Physics I

Major Course Requirements: 36 hours

BIO 204	General Zoology	BIO 354	General Genetics
BIO 214	General Botany	BIO 391	Advanced Topics* <u>or</u>
BIO 314	Human Anatomy & Physiology I <u>or</u>	BIO 392	Advanced Topics* <u>or</u>
BIO 364	Comparative Anatomy of Vertebrates	BIO 393	Advanced Topics*
BIO 333	General Ecology	BIO 423	Principles of Cell Biology
BIO 344	Microbiology	BIO 433	Field Biology
		BIO 492-4	Special Problems/Research

*Only one Advanced Topics course is required. However, more than one Advanced Topics course may be taken to meet the Major Course Requirements.

Requirements for the BS Degree with Major in Mathematics

- 1) Complete the campuswide General Education Requirements and Graduation Requirements (see **Academic Policies** for both).
NOTE: Mathematics majors must earn a grade of C or better in MTH 143, 153, or 185 to fulfill the mathematics general education requirement.
- 2) Pass each of the Support Course Requirements and each of the Major Course Requirements listed below with a grade of C or better.

SUPPORT COURSE REQUIREMENT: 3 hours

CIS 203	Programming Fundamentals
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Major Course Requirements: 41 hours

MTH 185	Analytic Geometry & Calculus I	MTH 354	Linear Algebra
MTH 186	Calculus II	MTH 401	Seminar in Mathematics I
MTH 210	Discrete Mathematics	MTH 402	Seminar in Mathematics II
MTH 215	Calculus III	MTH 413	History of Mathematics
MTH 223	Differential Equations	MTH 450	Advanced Calculus
MTH 343	Modern Geometry	MTH 483	Probability & Statistics
MTH 353	Modern Abstract Algebra		

Recommended Electives

ACC 243	Principles of Financial Accounting	PHY 214	General Physics I &
CHM 135	College Chemistry I	PHY 224	General Physics II <u>or</u>
CHM 145	College Chemistry II	PHY 125	Engineering Physics I &
ECO 213	Principles of Economics I: Macro	PHY 215	Engineering Physics II

Requirements for the AS Degree with Emphases in Prechemistry, Predental Hygiene, Preengineering, Premedical Technology, and Prepharmacy

NOTE: Students with an interest in *predental, premedical, or preveterinary medicine* should look under **Requirements for BA or BS Degree with Major in Biology**.

- 1) Complete the required courses for the AS degree and the Graduation Requirements (for both see **Academic Policies**).
- 2) Complete 38 semester hours, choosing from the courses listed under one of the emphases below.

NOTE: Because requirements vary from one professional school to another, preprofessional students should work closely with their advisers and specify the particular professional school to which they plan to make application.

Prechemistry

CHM 135	College Chemistry I	MTH 186	Calculus II
CHM 145	College Chemistry II	MTH 215	Calculus III
CHM 335	Organic Chemistry I	MTH 223	Differential Equations
CHM 345	Organic Chemistry II	PHY 125	Engineering Physics I
MTH 185	Analytic Geometry & Calculus I	PHY 215	Engineering Physics II

Premedical Technology and Predental Hygiene

BIO 105	General Biology	CHM 135	College Chemistry I
BIO 204	General Zoology	CHM 145	College Chemistry II
BIO 314	Human Anatomy & Physiology I	MTH 143	College Algebra
BIO 324	Human Anatomy & Physiology II	MTH 153	Precalculus
BIO 344	Microbiology	PHY 214	General Physics I

Preengineering

NOTE: This program is based upon a long-established transfer agreement between HLG and the University of Missouri-Rolla.

CHM 135	College Chemistry I	MTH 215	Calculus III
CHM 145	College Chemistry II	MTH 223	Differential Equations
CIS 203	Programming Fundamentals	PHY 125	Engineering Physics I
ECO 213	Principles of Economics I: Macro	PHY 215	Engineering Physics II
MTH 185	Analytic Geometry & Calculus I	PHY 236	Engineering Mechanics—Statics
MTH 186	Calculus II	PHY 237	Engineering Mechanics—Dynamics

Prepharmacy

NOTE: Because requirements vary from one school of pharmacy to another, prepharmacy students should work closely with their faculty advisers and specify the particular school of pharmacy that they desire to enter. The following electives have been approved by the St. Louis College of Pharmacy for transfer into their program. Ten semester hours of freshman and sophomore pharmacy courses, which are not included in the electives, may be made up in their summer program. Therefore, students may complete the five-year program with two years at HLG and three years at St. Louis College of Pharmacy. It is imperative for students who choose to take one year of prepharmacy at HLG rather than two years to consult with their faculty advisers, for this decision will cause a slight alteration in their freshman schedule.

BIO 105	General Biology	CHM 335	Organic Chemistry I
BIO 204	General Zoology	CHM 345	Organic Chemistry II
BIO 344	Microbiology	MTH 127	Elementary Statistics
CHM 135	College Chemistry I	MTH 143	College Algebra
CHM 145	College Chemistry II	PHY 214	General Physics I

Requirements for Minors

A grade of C or better is required in all courses in a minor.

Biology 18 hours— must include BIO 204 and 214

Chemistry 18 hours— must include CHM 335 and 345 (CHM 104 will not count)

Mathematics 20 hours above MTH 185, or 17 hours above MTH 185 plus a 3-hour CIS course

Physics 18 hours— (PHY 214 and 224 will not count toward this minor unless a special exception is made by the department chair.)

Course Offerings

BIOLOGY

BIO 103 Conservation of Renewable Resources **3 hours**

Focuses on the problems arising from the pollution of air, soil, and water; includes a survey of natural forests. Stresses the relationship of man to the environment. Offered alternate years in the May term and by independent study.

BIO 105 General Biology **4 hours**

An introductory study of the biological world with emphasis directed toward aesthetic appreciation, scientific method, basic understanding of general principles and laws, and some of the more important human systems. Three one-hour lectures and one two-hour laboratory period each week. Lab fee. Offered fall and spring semesters and summer term.

BIO 134 Fundamentals of Environmental Ecology **4 hours**

Combines elements of conservation, environmental science, and ecology and emphasizes man's effect on his environment and the living things in it. Three one-hour lectures and one two-hour laboratory period each week. Lab fee. Offered spring semester and alternate summers.

BIO 144 Introduction to Insects **4 hours**

Includes the morphology, physiology, development, and ecology of insects. Emphasizes the classification of orders and common families. Lab fee. Offered fall semester, odd years.

BIO 191-3 Special Topics **1-3 hours**

Select topics to meet special needs. Prerequisites: Sophomore standing and consent of instructor.

BIO 204 General Zoology **4 hours**

Examines fundamental biological phenomena and the classification, morphology, physiology, habitats, life histories, and economic importance of animals. Three one-hour lectures and one three-hour laboratory period each week. Lab fee. Prerequisite: BIO 105 or consent of instructor. Offered spring semester.

BIO 214 General Botany **4 hours**

Studies fundamental biological phenomena and the classification, morphology, physiology, habitats, life histories, and economic importance of plants. Three one-hour lectures and one three-hour laboratory period each week. Lab fee. Offered fall semester.

BIO 254 Essentials of Human Anatomy and Physiology I **4 hours**

Focuses on the fundamental principles of how the human body is organized and how it functions. Topics include basic chemistry and biochemistry; cell structure and metabolism; tissues; integumentary; skeletal, muscular, nervous, and endocrine systems; and the special senses. Lab fee. Corequisite: Enrollment in laboratory. Prerequisite: BIO 105 or consent of instructor. Offered fall semester.

BIO 264 Essentials of Human Anatomy and Physiology II **4 hours**

Continuation of BIO 254. Topics include cardiovascular, lymphatic, digestive, respiratory, urinary, and reproductive systems; function and composition of blood; nutrition; water and electrolyte balance; growth and development; and genetics. Lab fee. Corequisite: Enrollment in laboratory. Prerequisite: BIO 254 or consent

of instructor. Offered spring semester.

BIO 291-3 Special Topics **1-3 hours**
Select topics to meet special needs. Prerequisites: Sophomore standing and consent of instructor.

BIO 314 Human Anatomy and Physiology I **4 hours**
The structure, relationship, organization, function, and integration of the organs and systems of the human body. Lab fee. Corequisite: Enrollment in laboratory. Prerequisite: BIO 105. Offered fall semester.

BIO 324 Human Anatomy and Physiology II **4 hours**
A continuation of BIO 314. Lab fee. Corequisite: Enrollment in laboratory. Prerequisite: BIO 314 or consent of instructor. Offered spring semester.

BIO 333 General Ecology **3 hours**
The relationships and interactions between organisms and their physical and biotic environments. Prerequisites: BIO 204 and 214 or consent of instructor. Offered spring semester, odd years.

BIO 344 Microbiology **4 hours**
An introductory study of microorganisms dealing with the morphology, physiology, and culturing of microbes and their relation to soil, water and milk supplies, food preservation, and disease. Two one-hour lectures and two two-hour laboratory periods each week. Lab fee. Prerequisites: BIO 105 or 204; CHM 104 or 124 or 135. Offered spring semester and summer term.

BIO 354 General Genetics **4 hours**
Surveys the mechanics and chemistry of transmission of characteristics, chromosomal properties, and probability of inheritance with an emphasis on human genetics. Three one-hour lectures and one two-hour laboratory period each week. Lab fee. Prerequisites: BIO 105 or 204; CHM 124 or 135; MTH 143; and sophomore standing. Offered fall semester, even years.

BIO 364 Comparative Anatomy of Vertebrates **3 hours**
Anatomical structures and functional relations between the classes of vertebrates with emphasis on morphology and development. Prerequisite: BIO 204 or consent of instructor. Offered upon sufficient demand.

BIO 391-3 Advanced Topics **1-3 hours**
Under the supervision of the adviser, the student will do independent research, either in the laboratory or through a literature survey, or frequently both, on an approved topic of special interest to the student. Students who are interested in a health-related field can fulfill this requirement through job shadowing or participation in an internship. Prerequisites: Junior standing and consent of instructor. Offered as needed.

BIO 423 Principles of Cell Biology **3 hours**
The structure, organization, and function of cells as the basic unit of a living organism. Three one-hour lectures each week. Prerequisites: BIO 105, 344; CHM 124 or 135; and junior standing. Offered fall semester, odd years.

BIO 433 Field Biology **3 hours**
Emphasizes distinguishing characteristics and methods of identifying flora and fauna with an emphasis on local forms. Includes techniques of collecting, cataloging, and preserving for museum or study collections. One three-hour combined lecture and laboratory. Lab fee. Prerequisites: BIO 105, 204, 214, and junior standing or consent of instructor. Offered fall term, even years.

BIO 440 Pathophysiology **4 hours**
Focuses on disease processes involving the major body systems. Includes fluid and electrolyte balance/imbalance as an essential aspect of understanding disease processes. Prerequisites: BIO 324, 344, and CHM 104. Offered spring semester, even years.

BIO 492-4 Special Problems/Research **2-4 hours**
Under the supervision of the adviser, the student will do independent research, either in the laboratory or through a literature survey, or frequently both, on an approved topic of special interest to the student. Students who are interested in a health-related field can fulfill this requirement through job shadowing or participation in an internship. Prerequisites: BIO 391-3, senior standing, and consent of instructor. Offered spring semester, as needed.

CHEMISTRY**CHM 104 Foundations of Chemistry****4 hours**

Introduces the basic ideas and methods of chemistry, including nomenclature, chemical bonding, stoichiometry, solution and gas law problems, and a brief introduction to organic chemistry. Lab fee. Offered summer term.

CHM 135 College Chemistry I**5 hours**

The basic laws and theories of chemistry with considerable emphasis on electronic structure and the periodic relationships of elements. This course is designed for those students who plan to do further work in chemistry. The course consists of four one-hour lectures and one three-hour laboratory period each week. A one-hour workshop period each week may be required by the instructor. Lab fee. Prerequisite or corequisite: MTH 143. Offered fall semester.

CHM 145 College Chemistry II**5 hours**

Solutions, chemical kinetics, chemical equilibrium, thermodynamics, and electrochemistry. Laboratory work includes an introduction to semimicro methods of qualitative analysis and the study of some equilibrium systems. The course consists of four one-hour lectures and one three-hour laboratory period each week. A one-hour workshop period each week may be required by the instructor. Lab fee. Prerequisite: CHM 135. Credit, 5 semester hours; 4 semester hours for lecture portion only. Offered spring semester.

CHM 191-3 Special Topics**1-3 hours**

Select topics to meet special needs.

CHM 291-3 Special Topics**1-3 hours**

Select topics to meet special needs.

CHM 335 Organic Chemistry I**5 hours**

Theory and mechanisms of the basic reactions of organic compounds and their derivatives. Emphasis on alkyl halides, alkanes, alkenes, stereochemistry, alicyclics, alkynes, and dienes. Four one-hour lectures and one three-hour laboratory period each week. Lab fee. Prerequisite: At least a C in CHM 114 or CHM 135 or CHM 145. Offered fall semester.

CHM 345 Organic Chemistry II**5 hours**

Continuation of CHM 335. Emphasis on aromatic compounds, interpretive spectroscopy, alcohols, carboxylic acids and their derivatives, aldehydes, ketones, amines, and ethers. Four one-hour lectures and one three-hour laboratory period each week. Lab fee. Prerequisite: CHM 335. Offered spring semester.

CHM 391-3 Advanced Topics**1-3 hours**

Select topics to meet special needs.

MATHEMATICS

NOTE 1: A mathematics grid (based on ACT mathematics subscore, courses taken, and course grades) will be used by advisers to place students in the appropriate mathematics course level. Student who think that they should start in a higher-level course may request a placement exam from the chair of the Mathematics Department.

NOTE 2: The Texas Instruments TI-83 or TI-84 graphing calculator is required for MTH 127 through MTH 493.

MTH 100 Fundamentals of Mathematics**3 hours**

Reviews the fundamentals of mathematics, including operations involving whole numbers, operations involving fractions and decimals, ratios and proportions, percents, English and metric systems of measurement, geometry, elementary algebra, with applications of basic math to daily living. Offered fall and spring semesters.

MTH 101 Introduction to the Metric System**1 hour**

A course intended to acquaint the layman with the metric units of length, area, volume, and applications. Offered upon sufficient demand.

MTH 110 Elementary Algebra**3 hours**

Preliminary to Intermediate Algebra, this course is recommended for students who have had one year or less of high school algebra. An introduction to the real numbers, polynomials, linear and quadratic equations, equations and inequalities in two variables, rational expressions, roots, and exponents. Prerequisite: Mathematics-grid placement or a grade of C or better in MTH 100. Offered fall and spring semesters.

MTH 113 Introduction to Mathematics**3 hours**

Surveys several branches of mathematics, including algebra, geometry, probability, and statistics, with applications. This course is not for mathematics or science majors. Offered upon sufficient demand.

MTH 123 Intermediate Algebra**3 hours**

Preliminary to MTH 143 (College Algebra), this course is recommended for students who have had less than two years of high school algebra. Emphasis is placed on linear equations, word problems, graphing, quadratic equations, and inequalities. Prerequisite: Mathematics-grid placement or grade of C or better in MTH 110. Offered fall and spring semesters.

MTH 127 Elementary Statistics**3 hours**

A study of the basic elements of statistics with applications. Prerequisite: MTH 123. Offered fall semester.

MTH 131 Introduction to Contemporary Mathematics**3 hours**

Introduces contemporary mathematics and its connection to society and includes management science, statistics, coding theory, social choice and decision making, growth models, and geometric size and shape. This course *will not* serve as a prerequisite to any other course, nor will it fulfill the general education mathematics requirement for majors in business, computer information systems, education, nursing, or science. Prerequisite: Mathematics-grid placement or grade of C or better in MTH 123. Offered fall and spring semesters.

MTH 143 College Algebra**3 hours**

Studies linear and quadratic functions, inequalities, polynomials, systems of equations, and exponential and logarithmic functions. Prerequisite: Mathematics-grid placement or grade of C or better in MTH 123. Offered fall and spring semesters.

MTH 153 Precalculus**5 hours**

Topics from algebra and trigonometry preparatory to a study of calculus. Emphasis on the theory of equations and algebraic, exponential, logarithmic, and trigonometric functions and their graphs. Prerequisite: Mathematics-grid placement or grade of C or better in MTH 143. Offered spring semester.

MTH 163 Structure of the Real Number System**3 hours**

Studies the development of the real number system and its subsystems. Prerequisite: MTH 143. Offered fall semester.

MTH 185 Analytic Geometry and Calculus I**5 hours**

Studies the limits, continuity, derivatives, and topics in analytic geometry. Introductory integration and applications. Prerequisite: Mathematics-grid placement or grade of C or better in MTH 153 or consent of instructor. Offered fall semester.

MTH 186 Calculus II**5 hours**

Focuses on calculus of trigonometric; logarithmic and exponential functions; indeterminate forms; improper integrals; infinite series. Prerequisite: MTH 185. Offered spring semester.

MTH 191-3 Special Topics**1-3 hours**

Select topics to meet special needs.

MTH 210 Discrete Mathematics**3 hours**

Topics include logic, set theory, graph theory, number theory, combinatorics, Boolean algebra, generating functions, recurrence relations, and applications. Prerequisite: MTH 143. Offered spring semester, even years.

MTH 215 Calculus III**5 hours**

Focuses on vectors, three-dimensional analytic geometry, partial differentiation, multiple integrals, and vector calculus. Prerequisite: MTH 186. Offered fall semester.

- MTH 223 Differential Equations** **3 hours**
 Studies common types of ordinary differential equations with applications. Prerequisite: MTH 215. Offered spring semester.
- MTH 273 Business Statistics** (same as BUS 273) **3 hours**
 Collection, analysis, and presentation of business data; includes the study of averages, dispersion, sampling, reliability, index numbers, time series, and simple correlation. Prerequisite: Grade of C or better in MTH 143. Offered fall semester; summer term, odd years.
- MTH 291-3 Special Topics** **1-3 hours**
 Select topics to meet special needs.
- MTH 310 Technology in Mathematics** **3 hours**
 Gives students exposure to current technology used in mathematics, including data collection methods, computer software, and graphing calculators. Prerequisite: MTH 215. Offered spring semester, odd years.
- MTH 323 Advanced Differential Equations** **3 hours**
 Solution methods for initial and boundary value problems; linear and nonlinear systems; applications. Prerequisite: MTH 223. Offered upon sufficient demand.
- MTH 324 Partial Differential Equations** **3 hours**
 Fourier series and applications to solutions of partial differential equations. Prerequisite: MTH 223. Offered upon sufficient demand.
- MTH 333 Applied Calculus** (same as BUS 333) **3 hours**
 An intuitive approach to differential and integral calculus with emphasis on application to business. This course is geared primarily for business administration majors. It will not fulfill requirements for mathematics majors and may not be taken by students who have earned credit for MTH 185. Prerequisite: Grade of C or better in MTH 143. Offered spring semester.
- MTH 343 Modern Geometry** **3 hours**
 Elementary geometry, Euclidean geometry, and non-Euclidean geometry from an axiomatic approach. Prerequisites: MTH 185, 186, 215, or consent of instructor. Offered spring semester, odd years.
- MTH 353 Modern Abstract Algebra** **3 hours**
 The number system, groups, rings, integral domains, and fields. Prerequisites: MTH 185, 186, 215, or consent of instructor. Offered spring semester, even years.
- MTH 354 Linear Algebra** **3 hours**
 The basic properties of matrices, determinants, vectors and vector spaces, and linear transformations. Prerequisites: MTH 185, 186, 215, or consent of instructor. Offered fall semester, odd years.
- MTH 401 Seminar in Mathematics I** **1 hour**
 Surveys the various fields of mathematics and their interrelationship. Includes preparation for exams in the major area. Seminar will meet two hours per week. Prerequisite or Corequisite: MTH 215. Offered fall semester, odd years.
- MTH 402 Seminar in Mathematics II** **1 hour**
 Continuation of MTH 401. Prerequisite: MTH 401. Offered spring semester, even years.
- MTH 413 History of Mathematics** **3 hours**
 Mathematics from ancient times through the development of the calculus with emphasis on the mathematical methods of mathematicians studied. Prerequisites: MTH 185, 186, 215, or consent of instructor. Offered fall semester, even years.
- MTH 450 Advanced Calculus** **3 hours**
 Methods of real analysis, topology of the real numbers, sequences and series, limits, uniform convergence, differentiation, and the Riemann-Stieltjes integral. Prerequisites: MTH 185, 186, 215. Offered fall semester, odd years.
- MTH 470 Complex Analysis** **3 hours**
 Complex numbers, elementary functions and their mappings. Power series and analytic functions; conformal mappings. Cauchy's theorem and integral formula. Taylor and Laurent expansions and residues.

Prerequisites: MTH 185, 186, 215. Offered upon sufficient demand.

MTH 483 Probability and Statistics **3 hours**

Probability theory and statistics using methods of calculus. Prerequisites: MTH 185, 186, 215, or consent of instructor. Offered fall semester, even years.

MTH 491-3 Advanced Topics **1-3 hours**

Select topics to meet special needs.

PHYSICAL SCIENCE

NOTE: PHS 133 or PHS 153 will be offered in the summer.

PHS 103 Survey of Physical Science for PreK-6 Educators **4 hours**

An overview of several prominent areas of physical science; in-class activities, demonstrations, and other laboratory-type experiences. (*Only majors in early childhood and elementary education may enroll.*) Offered spring semester.

PHS 131 Earth Science I Laboratory **1 hour**

Activities and experiments related to topics covered in PHS 133. Lab fee. Prerequisite or corequisite: PHS 133. Offered fall semester, even years, upon sufficient demand.

PHS 133 Earth Science I **3 hours**

Focuses on the solid earth, its mineral makeup, its interior structure, and the processes which act to shape the earth. Offered fall semester; alternate summers.

PHS 141 Earth Science II Laboratory **1 hour**

Activities and experiments related to topics covered in PHS 143. Lab fee. Prerequisite or corequisite: PHS 143. Offered spring semester, odd years, upon sufficient demand.

PHS 143 Earth Science II **3 hours**

Focuses on the oceans, the atmosphere, and on astronomy; special emphasis on meteorology. Offered spring semester, odd years.

PHS 153 Introductory Astronomy **3 hours**

An overview of astronomy — the earth's place in the universe: the solar system, stars, and galaxies. Explains how observations are made. Offered fall semester, odd years; spring semester, even years; alternate summers.

PHS 291-3 Special Topics **1-3 hours**

Select topics to meet special needs.

PHS 391-3 Advanced Topics **1-3 hours**

Select topics to meet special needs.

PHYSICS

PHY 125 Engineering Physics I **5 hours**

Examines the fundamentals of vectors, kinematics and dynamics, work-energy, momentum rotational motion, statics, elasticity, fluids, and simple harmonic motion. Five one-hour lectures and one three-hour laboratory period each week. Lab fee. Corequisite: MTH 186. Offered spring semester.

PHY 173 Engineering Drawing **3 hours**

A combined course in engineering drawing and descriptive geometry, including lettering, sketches, use of instruments, orthographic projection, detail and assembly drawings, dimensioning, tracings, space relations of points, lines and surfaces, intersections, developed surfaces, and graphical solution. One one-hour lecture and two three-hour laboratory periods each week. Offered upon sufficient demand.

PHY 214 General Physics I **4 hours**

Focuses on mechanics, heat, and sound. Three one-hour lectures and one three-hour laboratory period each week. This course will not meet requirements of engineering or physics majors. Lab fee. Prerequisites: MTH 143, 153. Offered spring semester.

PHY 215 Engineering Physics II **5 hours**
 Focuses on electricity, magnetism, light, and modern physics. Four one-hour lectures and one three-hour laboratory period each week. Lab fee. Prerequisite: PHY 125. Corequisite: MTH 215. Offered fall semester.

PHY 224 General Physics II **4 hours**
 Focuses on electricity, magnetism, and modern physics. Three one-hour lecture hours and one three-hour laboratory period each week. Not for engineering or physics majors. Lab fee. Prerequisite: PHY 214. Offered fall semester.

PHY 233 Engineering Physics III **4 hours**
 Examines special relativity, quantum effects, atomic and nuclear structure, X-ray spectra, nuclear instrumentation, and nuclear reaction. Three one-hour lectures and one three-hour laboratory period each week. Lab fee. Prerequisite: PHY 215. Offered upon sufficient demand.

PHY 236 Engineering Mechanics—Statics **3 hours**
 Application of the principles of mechanics to problems of equilibrium. Topics include resultants, equilibrium, friction, trusses, center of gravity, and moment of inertia. Prerequisites: PHY 125, 215, and MTH 215. Offered spring semester.

PHY 237 Engineering Mechanics—Dynamics **3 hours**
 Application of principles of mechanics to problems of motion and acceleration. Topics include motion in the plane, force, mass, and acceleration; work and energy; and impulse and momentum. Prerequisites: PHY 125, 215, and MTH 215.

PHY 291-3 Special Topics **1-3 hours**
 Select topics to meet special needs.

PHY 391-3 Advanced Topics **1-3 hours**
 Select topics to meet special needs.

GENERAL SCIENCE

SCI 303 History and Philosophy of Science **3 hours**
 The historical and philosophical development in selected areas of the natural sciences, from antiquity to the modern age. Addresses how people from various cultures and societies have contributed to the body of knowledge encompassed by the natural sciences and how this knowledge is beneficial to people over a broad range of disciplines. Prerequisite: Junior standing or consent of instructor. Offered fall semester, even years.

SCI 384 Teaching Science in Secondary School (same as SED 384) **3 hours**
 Designed for preservice secondary science teachers, to acquaint them with laboratory and teaching methods, materials, resources, safety, inquiry, and evaluation techniques for teaching science. Prerequisite: SED 323. Offered fall semester.