996 Doctoral Recital Performance
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in Music Performance.
Directed experience in recital performance in partial fulfillment of requirements for the Doctor of Musical Arts degree.

997 Doctoral Concert Conducting
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in Music Performance.
Directed experience in concert conducting in partial fulfillment of requirements for the Doctor of Musical Arts degree.

998 Doctoral Music Composition
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in the Music Composition major.
Directed experience in composition in partial fulfillment of requirements for the Doctor of Musical Arts degree.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in the School of Music. Approval of school.
Doctoral dissertation research.

192 Environmental Issues Seminar
Fall, Spring. 1 credit. A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Agriculture and Natural Resources; Engineering: Social Science; Communication Arts and Sciences. R: Open only to students in the College of Agriculture and Natural Resources or College of Engineering or College of Natural Science or College of Communication Arts and Sciences or College of Social Science.
Approval of college.
Environmental issues and problems explored from a variety of perspectives, including legal, scientific, historical, political, socio-economic, and technical points of view.

201 Science Problem Solving Seminar I
Fall, 2(2-0) P:M: (MTH 1825 or concurrently or MTH 116 or concurrently or MTH 132 or concurrently) R: Approval of college.
Problem solving principles and strategies used in the disciplines of science and mathematics. Activities reflecting the types of problems encountered.

202 Science Problem Solving Seminar II
Spring, 2(2-0) P:M: (NSC 201) R: Approval of college.
Continuation of NSC 201.

301 Science for Elementary Schools
Fall, Spring. 1 to 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: (NSC 202) R: Open only to students in the Elementary Teacher Education Program.
Using topics related to a faculty member's ongoing research, students explore the relationship between science and technology and social issues.

390 Special Problems
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department.
Faculty directed individualized study of an interdisciplinary problem.

401 Science Laboratories for Secondary Schools (W)
Fall, 4(2-6) R: Open only to seniors in the BA degree in Chemistry, or the BS degree in Biological Science-Interdepartmental or Earth Science-Interdepartmental or General Science-Interdepartmental or Physical Science-Interdepartmental major or their associated LB8 majors.
Laboratory equipment, supplies, demonstrations, exercises, and safety. Care of live organisms. Disposal of biological and chemical wastes. Field trips required.

448 Ecology, Law and Economics
Spring, 3(3-0) P:M: (EC 211)
Review and integrate principles of ecology, fundamentals of law, and principles of economics into a conceptual model that describes interrelations among the natural system, the economy, and the state. Analyze and assess the legal-economic natural resource and environmental policies in the context of the integrated model. Relate the ecology-law-economics model to emerging paradigms of sustainable development, ecological economics, industrial ecology, and the Natural Step.

490 Special Problems
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department.
Faculty directed individualized study of an interdisciplinary problem.

491 Selected Topics
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department.
Selected interdisciplinary topics not normally covered in other courses.

495 Capstone in Human Biology (W)
Fall, Spring, 2(2-0) P:M: Completion of Tier I writing requirement. R: Open only to seniors in the Human Biology or Lyman Briggs Human Biology major.
Integration of human biology disciplines with a focus on health and disease.

496 Directed Study in Human Biology
Fall, Spring. Summer. 1 to 3 credits. P:M: Completion of Tier I writing requirement.
Directed studies in human biology.

497 Internship in Human Biology
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: Completion of Tier I writing requirement. R: Practical experience applying human biology training outside the classroom setting.

498 Research in Human Biology
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: Completion of Tier I writing requirement.
Research in faculty laboratories.

499 Research
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors in the College of Natural Science with a teacher certification option.
Research in faculty laboratories. Oral and written presentations.

600 Special Problems for K-8 Teachers
Fall, Spring, Summer. 1 to 5 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Elementary teacher certification, 3 years teaching experience. Approval of department.
Supervised study of problems in biological, physical, or earth sciences.
Interrelationships among and between organisms, including protists, plants, animals, and decomposers.

Biotic and abiotic features of lakes, streams, forest ecosystems, and microbial ecosystems.

Use of microscopy techniques for selected research topics.

Selected current topics covering the broad areas of food safety as they relate to production, processing, transport, microbiology, toxicology, and social and human dimensions.

In-depth discussion of selected problems in food safety.

Foundations of scientific inquiry. Recommended scientific best-practices including principles and practices of research integrity and professionalism. Evaluation of scientific quality and productivity.


Writing in the Sciences
Fall, Spring. 2(2-0) A student may earn a maximum of 6 credits in all enrollments for this course. R: Teacher Certification required. Approval of college. Supervised study of problems in biological or physical science.

Cell and Molecular Biology
Summer. 2 credits. R: Secondary certification in biology, 3 years teaching experience. R: Secondary certification in biology; 3 years teaching experience; approval of college. Molecular basis of structure and function of cells. Protein structure and function, cell physiology, metabolic energy and transmission of genetic information.

Cell and Molecular Biology Laboratory
Summer. 3 credits. R: Secondary certification in biology; 3 years teaching experience. R: Approval of college. Generation of laboratory exercises appropriate for secondary students.

Interdisciplinary Seminar in Biological Science
Fall, Spring. 1 credit. R: Secondary certification in biology; 3 years teaching experience. R: Approval of college. Interrelationships of biological science and technology. Role of society in regulation of research and technological innovations.

Environmental and Behavioral Biology
Summer. 3 credits. Given only at W.K. Kellogg Biological Station. RB: Secondary certification in biology; 3 years teaching experience. R: Approval of college. Biotic and abiotic features of lakes, streams, forest ecosystems, and microbial ecosystems.

Environmental and Behavioral Biology Laboratory
Summer. 3 credits. Given only at W.K. Kellogg Biological Station. RB: Secondary certification in biology, 3 years teaching experience, R: Approval of college. Laboratory and field examinations of lake, stream and forest ecosystems.

Problem Solving Techniques in Physical Science
Summer. 2 credits. R: Secondary certification in chemistry or physics or earth science, 3 years teaching experience. R: Approval of college. Measurement and analysis of chemical, physical, and geological phenomena.

Chemistry for Teachers
Summer. 2 credits. R: Secondary certification in chemistry or physics or earth science, 3 years teaching experience. R: Approval of college. Intensive lecture and laboratory study of basic chemistry from a modern viewpoint.

Physics for Teachers
Summer. 2 credits. R: Secondary certification in chemistry or physics or earth science, 3 years teaching experience. R: Approval of college. Intensive lecture and laboratory study of basic physics from a modern viewpoint.

Earth Science for Teachers
Summer. 2 credits. R: Secondary certification in chemistry or physics or earth science, 3 years teaching experience. R: Approval of college. Intensive lecture and laboratory study of basic earth sciences from a modern viewpoint.

Interdisciplinary Seminar in Physical Science
Summer. 2 credits. R: (NSC 861 and NSC 862 and NSC 863) R: Secondary certification in chemistry or physics or earth science or physical science, 3 years teaching experience. R: Approval of college. Interrelationships of the physical sciences. The role of society in regulation of science to technology transfer.

Teaching College Science
Spring. 2 credits. R: One year of graduate study in a biological or physical science. R: Approval of college. Philosophy of education. Ethnic, gender, and cultural issues. Designing a laboratory course. Problems of class size. Instructional technologies. Assessment and evaluation.

Research for Inservice Teachers
Fall, Spring. Summer. 1 to 8 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to inservice K-12 teachers with baccalaureate degrees. Research in faculty laboratories. Oral and written presentations.
Natural Science—NSC

899 Master's Thesis Research
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open only to master's students in the College of Natural Science. Approval of college. Master's thesis research.

901 Frontiers in Biological Science
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Secondary certification in chemistry or physics or earth science or physical science or biology, 3 years teaching experience. Approval of college. Weekend workshops with research faculty exploring background and latest findings in their area of research.

902 Frontiers in Physical Science
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 40 credits in all enrollments for this course. R: Open only to students with secondary teacher certification in chemistry or physics or earth science or physical science or biology and 3 years of teaching experience. Approval of college. Weekend workshops with research faculty exploring background and latest findings in their area of research.

NEUROLOGY AND OPTHALMOLOGY NOP

Department of Neurology and Ophthalmology
College of Human Medicine
College of Osteopathic Medicine

552 Medical Neuroscience
Spring. 4(3-2) Interdepartmental with Physiology; Radiology; Human Anatomy. R: Graduate-professional students in the Colleges of Human Medicine and Osteopathic Medicine. SA: ANT 552 Correlation of normal structure and function of the human nervous system with clinical testing, classical lesions, and common diseases.

590 Special Topics in Clinical Neuroscience
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 12 credits in all enrollments for this course. Work under the direction of a faculty member on an experimental, theoretical or applied problem in clinical neuroscience or neurology.

617 Neurology Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course. RB: (MED 608) R: Open only to graduate-professional students in College of Human Medicine. SA: MED 617 Office and inpatient experience. Evaluation and management of neurological disease.

620 Directed Studies
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to juniors or seniors in the College of Osteopathic Medicine. Completion of Semester 6 in the graduate-professional program. Study in general or specialty neurology and ophthalmology.

656 Neurology Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate-professional students in the College of Osteopathic Medicine upon completion of Units I and II. SA: PMR 856 Clinical exposure in neurology. Program structure developed to achieve proficiency in motor skills, aptitudes; comprehension of concepts and principles; patient evaluation, diagnosis, management, and therapy.

835 Topics and Methods in Neuroepidemiology
Summer of even years. 3(3-0) Interdepartmental with Epidemiology. Administered by Department of Epidemiology RB: (EPI 810) Epidemiology of neurologic conditions and discussion of the inherent difficulty in studying these disorders.

859 Research Literature in Neuroscience
College of Natural Science

800 Neuroscience Research Forum
Fall, Spring, Summer. 1(1-0) A student may earn a maximum of 8 credits in all enrollments for this course. RB: Bachelor's degree in neuroscience, biological or psychological science, or related area. Readings, presentations and discussions of research literature in neuroscience. Professional development.

804 Molecular and Developmental Neurobiology
Fall. 3(3-0) Interdepartmental with Pharmacology and Toxicology; Psychology; Pathology; Zoology. RB: Bachelor's degree in a Biological Science or Psychology. R: Open only to graduate students in the Neuroscience major. Nervous system specific gene transcription and translation. Maturation, degeneration, plasticity and repair in the nervous system.

806 Advanced Neuroscience Techniques Laboratory
Summer. 3(0-9) Interdepartmental with Psychology; Pharmacology and Toxicology; Radiology; Physical Medicine and Rehabilitation. P.M. (NEU 804 or concurrently) RB: (PHM 827 and ANT 839 and PSY 811) R: Open only to doctoral students in the Neuroscience major. Methods of neuroscience research and the underlying principles on which these methods are based.

811 Advanced Behavioral Neuroscience
Spring. 3(3-0) Interdepartmental with Psychology. Administered by Department of Psychology. RB: (PSY 411) approval of department. R: Open only to graduate students in the Psychology and Neuroscience major. Biological mechanisms involved in learning and memory, motivated behaviors, biological rhythms, and psychopathologies.

827 Physiology and Pharmacology of Excitable Cells
Fall. 4(4-0) Interdepartmental with Pharmacology and Toxicology; Physiology; Zoology. Administered by Department of Pharmacology and Toxicology. RB: (PSL 431 or PSL 432 or BMB 461 or BMB 461 or ZOL 402) Function of neurons and muscle at the cellular level: membrane biophysics and potentials, synaptic transmission, sensory nervous system function.

900 Independent Study in Neuroscience
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. RB: Bachelor's degree in neuroscience, biology, psychology, or related area. Supervised student research on a specialized research topic in basic or clinical neuroscience.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 120 credits in all enrollments for this course. Doctoral dissertation research.

NURSING NUR

College of Nursing

202 Introduction to Nursing Practice I
Fall. 2(1-3) R: Open only to students in the College of Nursing except students in PreNursing and Registered Nurses. Theoretical concepts of nursing necessary for professional practice. Assessment, interpersonal communication, documentation and decision-making.

204 Introduction to Nursing Practice II

215 Core Competencies in Nursing I
Fall, Spring. 1(1-0) R: Open only to students in the College of Nursing. Assessment core nursing competencies applying natural, social and nursing science.