

Music—MUS

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.

203 Drew Laboratory Directed Studies
Fall, Spring, Summer. 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 Drew Laboratory students.

Using topics related to a faculty member's ongoing research, students explore the relationship between science and technology and social issues.

301 Science for Elementary Schools
Fall, Spring. 3(3-0) RB: Completion of an ISB and ISBL or ISP and ISPL course. Completion of the majority of complementary studies coursework in science and math. R: Open only to students in the Elementary Teacher Education Program.

Topics in earth science, life science, and physical science explored through discussion, demonstrations, readings, presentations, and field trips.

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 LBS 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 201)
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.

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.

NATURAL SCIENCE

NSC

College of Natural Science

101 Preview of Science
Fall. 1(1-0) Interdepartmental with Agriculture and Natural Resources; Engineering; Social Science. R: Approval of college.

Overview of natural sciences. Transitional problems. Communications and computer skills. Problem solving skills. Diversity and ethics problems in science. Science and society.

102 Preprofessional Freshman Seminar
Fall, Spring. 1(1-0)

Overview of human health care professions with emphasis on academic and nonacademic undergraduate preparation, campus resources, communication and computer skills, and collaborative learning.

- 651 Physical Science I**
Summer. 2 credits. R: Elementary teacher certification, 3 years teaching experience. Approval of college.
The nature of matter and energy including energy transfer, density, and conservation of mass. Properties of elements, mixtures, and compounds.
- 652 Physical Science II**
Summer. 2 credits. R: Elementary teacher certification, 3 years teaching experience. Approval of college.
Electricity and magnetism, force and motion, heat and temperature, sound, and light
- 653 Earth Science I**
Summer. 2 credits. R: Elementary teacher certification, 3 years teaching experience. Approval of college.
The solar system, including the sun, planets, earth, and its moon. Weather and the water cycle.
- 654 Earth Science II**
Summer. 2 credits. R: Elementary teacher certification, 3 years teaching experience. Approval of college.
Rocks, minerals, and fossils and the physical and geological processes that form them.
- 655 Life Science I**
Summer. 2 credits. R: Elementary teacher certification, 3 years teaching experience. Approval of college.
Structure, function, genetics, and classification of organisms, including protists, plants, animals, and decomposers.
- 656 Life Science II**
Summer. 2 credits. R: Elementary teacher certification, 3 years teaching experience. Approval of college.
Interrelationships among and between organisms and their surroundings. Ecosystems, habitats, food chains, cycles, and pollution.
- 800 Problems in Biological or Physical Science for Teachers**
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Teacher Certification required. Approval of college.
Supervised study of problems in biological or physical science.
- 802 Essentials of Electron Microscopy**
Fall. 2(2-0)
Principles of operation and uses of transmission and scanning electron microscopy. Related electron beam instruments. Specimen preparation and analytical methods.
- 810 Transmission Electron Microscopy Laboratory**
Fall, Spring, Summer. 3(1-4) RB: (NSC 802)
Use of transmission microscope and preparative equipment. Preparation techniques for specimens, photographic and darkroom use, and interpretation of micrographs.
- 820 Scanning Electron Microscopy; Energy Dispersive X-ray Microanalysis**
Fall, Spring. 3(2-2) RB: (NSC 802 or concurrently)
Use of scanning electron microscope and energy dispersive x-ray microanalysis. Machine variables, artifacts, quantitative analysis, specimen preparation, darkroom procedures.
- 825 Special Problems in Microscopy**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 40 credits in all enrollments for this course. RB: (NSC 802) and (NSC 810 and NSC 820 and NSC 837)
Use of microscopy techniques for selected research topics.
- 828 Food Safety Seminar Series**
Fall, Spring. 1(1-0) Interdepartmental with Veterinary Medicine; Agriculture and Natural Resources; Social Science. Administered by Veterinary Medicine. RB: Enrollment in graduate program in related discipline
Selected current topics covering the broad areas of food safety as they relate to production, processing, transport, microbiology, toxicology, and social and human dimensions.
- 829 Problems in Food Safety**
Fall. 1(1-0) Interdepartmental with Veterinary Medicine; Agriculture and Natural Resources; Social Science. Administered by Veterinary Medicine. RB: Enrollment in graduate program in related discipline
In-depth discussion of selected problems in food safety.
- 830 Nature and Practice of Science**
Fall, Spring. 1 credit.
Foundations of scientific inquiry. Recommended scientific best-practices including principles and practices of research integrity and professionalism. Evaluation of scientific quality and productivity.
- 837 Confocal Microscopy**
Fall, Spring. 2(2-2) Interdepartmental with Crop and Soil Sciences.
Confocal imaging, theory and practice. Basic optics. Lasers. Light paths for transmission, fluorescence and reflection. Image quality, analysis and processing.
- 840 Writing in the Sciences**
Fall, Spring, Summer. 2(2-0) A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Arts and Letters.
Discussion and critique of students' writing in peer response workshop groups
- 850 Cell and Molecular Biology**
Summer. 2 credits. RB: 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.
- 851 Cell and Molecular Biology Laboratory**
Summer. 3 credits. RB: Secondary certification in biology; 3 years teaching experience. R: Approval of college.
Generation of laboratory exercises appropriate for secondary students.
- 852 Interdisciplinary Seminar in Biological Science**
Fall, Spring, Summer. 1 credit. RB: 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.
- 855 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.
- 856 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.
- 860 Problem Solving Techniques in Physical Science**
Summer. 3 credits. RB: (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. Approval of college.
Measurement and analysis of chemical, physical, and geological phenomena.
- 861 Chemistry for Teachers**
Summer. 2 credits. RB: Secondary certification in chemistry or physics or earth science or physical science, 3 years teaching experience. R: Approval of college.
Intensive lecture and laboratory study of basic chemistry from a modern viewpoint.
- 862 Physics for Teachers**
Summer. 2 credits. RB: Secondary certification in chemistry or physics or earth science or physical science, 3 years teaching experience. R: Approval of college.
Intensive lecture and laboratory study of basic physics from a modern viewpoint.
- 863 Earth Science for Teachers**
Summer. 2 credits. RB: Secondary certification in chemistry or physics or earth science or physical science, 3 years teaching experience. R: Approval of college.
Intensive lecture and laboratory study of basic earth sciences from a modern viewpoint.
- 864 Interdisciplinary Seminar in Physical Science**
Summer. 2 credits. RB: (NSC 860) R: Approval of college.
Interrelationships of the physical sciences. The role of society in regulation of science to technology transfer.
- 870 Teaching College Science**
Spring. 2 credits. R: One year of graduate study in a biological or physical science. Approval of college.
Philosophies of education. Ethnic, gender, and cultural issues. Designing a laboratory course. Problems of class size. Instructional technologies. Assessment and evaluation.
- 889 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.

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 656
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.

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 401 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.

890 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.

992 Advanced Topics in Neuroscience
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. RB: (NEU 804 and NEU 811 and NEU 827 and ANT 839) Bachelor's degree in neuroscience, biology, psychology or related area.
Readings, presentations and discussion of specialized topics in 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.

NEUROLOGY AND OPHTHALMOLOGY 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.

NEUROSCIENCE NEU

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.

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
Spring. 4(2-6) P:M: (NUR 202 and PHM 350 or concurrently) C: PHM 350 concurrently.
Nursing practice concepts in simulated and clinical practice settings. Development of nursing practice psychomotor skills.

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.