SCIENCE AND MATHEMATICS  
EDUCATION

College of Natural Science

120 Seminar in Integrated Science for Elementary Schools  
Spring. 1(1-1) Interdepartmental with Teacher Education. P.M.: (BS 110 or BS 111 or CEM 141 or PHY 231 or PSL 250 or GLG 207 or PHY 231B or CEM 141 or BSB 145 or BSB 149 H or PSL 250 or ZOL 355) and (PHY 231 or PHY 231B or CEM 141 or BSB 145 and (GLG 207 or GEO 201 or AST 207)) R: Open only to students in the Integrated Science Teaching major. Not open to those with credit in SME 301. 

301 Science for Elementary Schools  
Fall, Spring. 3(2-5) R: Completion of an ISB and ISB laboratory or ISP and ISP laboratory course. Completion of the majority of complementary studies coursework in science and math required. Open only to students in the Elementary Teacher Education Program. SA: NSC 301 

651 Physical Science I  
Summer. 2 credits. R: Elementary teacher certification, 3 years teaching experience. R: Approval of college. SA: NSC 651 

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. R: Approval of college. SA: NSC 652 

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. R: Approval of college. SA: NSC 653 

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. R: Approval of college. SA: NSC 654 

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. R: Approval of college. SA: NSC 655 

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. R: Approval of college. SA: NSC 656 

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 must earn a maximum of 6 credits in all enrollments for this course. R: Secondary certification required. R: Approval of college. SA: NSC 800 

Supervised study of problems in biological or physical science.

850 Cell and Molecular Biology  
Summer. 2 credits. R: Secondary certification in biology, 3 years teaching experience. R: Approval of college. SA: NSC 850 

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. R: Secondary certification in biology, 3 years teaching experience. R: Approval of college. SA: NSC 851 

Generation of laboratory exercises appropriate for secondary students.

852 Interdisciplinary Seminar in Biological Science  
Fall, Spring, Summer. 1 credit. R: Secondary certification in biology, 3 years teaching experience. R: Approval of college. SA: NSC 852 

Interrelationships of biological science and technology. Role of society in regulation of research and technological innovations.
Science and Mathematics Education—SME

855 Environmental and Behavioral Biology
Summer. 3 credits. Spring. Given only at Sumner. Given only at W.K. Kellogg Biological Station. RB: Secondary certification in biology, 3 years teaching experience. R: Approval of college. SA: NSC 855
Biotic and abiotic features of lakes, streams, forest ecosystems, and microbial ecosystems.

856 Environmental and Behavioral Biology Laboratory
Summer. 3 credits. Summer. Given only at W.K. Kellogg Biological Station. RB: Secondary certification in biology, 3 years teaching experience. R: Approval of college. SA: NSC 856
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) Secondary certification in chemistry or physics or earth science or physical science, 3 years teaching experience. R: Approval of college. SA: NSC 861
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. SA: NSC 861
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. SA: NSC 862
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. SA: NSC 863
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. SA: NSC 864
Interrelationships of the physical sciences. The role of society in regulation of science to technology transfer.

870 Teaching College Science
Spring. 2 credits. RB: One year of graduate study in a biological or physical science. R: Approval of college. SA: NSC 870

889 Research for Inservice Teachers
Fall, Spring. Sumner. 1 to 8 credits. A student may earn a maximum of 10 credits in all enrollments for this course. RB: Open only to inservice K-12 teachers with baccalaureate degrees. R: Approval of college. SA: NSC 889
Research in faculty laboratories. Oral and written presentations.

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. RB: Secondary certification in chemistry or physics or earth science or physical science or biology, 3 years teaching experience. R: Approval of college. SA: NSC 901
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. RB: 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. R: Approval of college. SA: NSC 902
Weekend workshops with research faculty exploring background and latest findings in their area of research.

SMALL ANIMAL CLINICAL SCIENCES—SCS

Department of Small Animal Clinical Sciences
College of Veterinary Medicine

511 Veterinary Radiology
Fall. 1(1-0): R: Open only to graduate-professional students in College of Veterinary Medicine.
Principles of veterinary radiology, radiation safety, and normal radiologic anatomy.

611 Diagnostic Imaging Clerkship
Fall, Spring. Sumner. 3 credits. RB: Open only to graduate-professional students in the College of Veterinary Medicine. R: Approval of department.
Principles of ultrasound physics, ultrasound scanning techniques, and interpretation of ultrasound imaging.

612 Problems in Diagnostic Imaging Clerkship
Fall, Spring. Sumner. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. RB: (SCS 611) Completion of semester 5 of the graduate-professional program in the College of Veterinary Medicine.
Advanced diagnostic radiography, ultrasound imaging, and magnetic resonance imaging.

625 Small Animal General Medicine Clerkship
Fall, Spring. Sumner. 3 credits. RB: Completion of semester 5 of the professional veterinary program. R: Open only to fourth-year graduate-professional students in the College of Veterinary Medicine.
Principles of ultrasound physics, ultrasound scanning techniques, and interpretation of ultrasound imaging.

626 Small Animal Soft Tissue Surgery Clerkship
Fall, Spring. Sumner. 3 credits. RB: Completion of semester 5 of the professional veterinary program. R: Open only to graduate-professional students in College of Veterinary Medicine.
Diagnostic and treatment services for routine and emergency outpatients.

630 Spay/Neuter Clerkship
Fall, Spring. Sumner. 3 credits. RB: (SCS 626 and SCS 648) Completion of semester 5 of the graduate professional veterinary program.
Ovariectomy or ovariectomy. Aspects of pre- and post-operative management and anesthesia.

636 Problems in Soft Tissue Surgery Clerkship
Fall, Spring. Sumner. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. RB: (SCS 626) R: Completion of semester 5 of the graduate-professional program in the College of Veterinary Medicine.
Soft tissue surgery problems.

637 Operative Surgery Clerkship: Instruction and Review
Fall. 3 credits. RB: Completion of semester 5 of the professional veterinary program. R: Open only to graduate-professional students in College of Veterinary Medicine. R: Approval of department.
Participation in the instruction of VM 557 (Operative Surgery), with preparation for the laboratory and discussion after the laboratory. Performance of additional surgical procedures, case discussions, rounds, and anatomy review. Approved independent study project required.