

# COLLEGE OF SCIENCES AND HUMANITIES

[www.bsu.edu/sh](http://www.bsu.edu/sh)

North Quadrangle Building 112, 765-285-1042

Dean of the College: Michael A. Maggiotto

Associate Deans: Susan M. Johnson, Jeffry Grigsby, Kecia McBride

## INTERDEPARTMENTAL PROGRAMS

### SCIENCE

[www.bsu.edu/physics](http://www.bsu.edu/physics)

Director of Master's Programs: Thomas Robertson

### MASTER OF ARTS IN SCIENCE EDUCATION

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Common core, 12 hours				
Approved science education courses				6
SCI	699	Res Mth Ed	3	
RES	697	Research Ppr (1-3)		
<i>or</i>				
CRPRJ	698	Creat Proj (3 or 6)	3	
Complete one option				
<i>Option 1: High school, 18 hours</i>				
SCI	690	Wkshp Sci Ed	0-9	
<i>and/or</i>				
Approved course work in one or more of the following content areas: biology, chemistry, earth/space science (geology and/or astronomy), environmental science, or physics				9-18
				18 hrs
<i>Option 2: Elementary/middle school, 18 hours</i>				
SCI	690	Wkshp Sci Ed	0-9	
Approved course work in at least three of the following content areas: biology, chemistry, earth/space science (geology and/or astronomy), environmental science, or physics				9-18
				18 hrs
				30 hrs

The student will conduct science education research and write a research paper (RES 697) or do a creative project (CRPRJ 698) on a science education topic. The research paper or creative project earns a total of three hours credit.

## DOCTORAL PROGRAMS

### DOCTOR OF EDUCATION (EdD) IN SCIENCE EDUCATION

This degree prepares students to assume positions as science education leaders in the K–12 setting or as university science educators. The major consists of approximately equal components of education and science with supporting work in additional science fields. The dissertation is concerned with science education at the elementary, middle, secondary, or college level. A teaching internship, a required part of the program, gives the candidate experience in methods classes and in lower-division science classes. The program requires a minimum of 90 hours of approved graduate work beyond the bachelor's degree.

#### Degree Requirements

##### Major Area of Study

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Courses in major field selected from one of the following or related areas: biology, chemistry, computer science, geological sciences, mathematical sciences, natural resources and environmental management, physics/astronomy, or physiology/health science				25
SCI	696	Cur Is Sc Ed (3–6)	3	
SCI	790	Intern Sc Ed (1–4)	3	
ID	705	Resrch Collq (1–3)	2	
Cognate				
Courses in a science field different from the major or related area				15
Education				
Courses in education and science education not included in major				20
A course in learning or in development				3
EDPSY	646	Tests Meas	3	
EDHI	609	Prep Prof	3	
EDHI	610	Isu High Ed	3	
DISS	799	Drs Dissert (1–24)	10	
				90 hrs

**SCIENCE (SCI)**

**690 Workshop in Science Education. (1–12)** Practical experience with teaching science at specific level (early childhood, elementary, middle, secondary, or higher education) and/or specific topic (e.g., chemistry or geology). May be repeated for different level and/or topic.

*Prerequisite:* teaching experience or certification or permission of the instructor.

A total of 24 hours of credit may be earned, but no more than 12 in any one semester or term.

**695 Advanced Teaching Methods in Science. (3–6)** Recent developments in science teaching at specific level (early childhood, elementary, middle, secondary, or higher education) and/or specific topic (e.g., biology or physics). May be repeated for different level and/or topic.

*Prerequisite:* teaching experience or certification or permission of the instructor.

A total of 6 hours of credit may be earned.

**696 Current Issues in Science Education. (3–6)** Current research and theory of teaching science at specific level (early childhood, elementary, middle, secondary, or higher education) and/or specific science topic (e.g., chemistry or geology). May be repeated for different level and/or topic.

*Prerequisite:* permission of the instructor.

A total of 6 hours of credit may be earned.

**699 Research Methodology in Science Education. (3)** Identification of research problems in science and science education. Introduction to types of research, research design, and grant-writing. Review of literature pertinent to a special topic of student interest. Development of a research proposal.

*Prerequisite:* permission of the department chairperson.

**790 Internship in Science Education. (1–4)** Supervised experience in instruction of science or science education courses.

*Prerequisite:* permission of the department chairperson.

A total of 4 hours of credit may be earned.

## SOCIAL STUDIES

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[www.bsu.edu/history](http://www.bsu.edu/history)

*Director of Master's Program:* Sarah Drake Brown

### MASTER OF ARTS IN SOCIAL SCIENCE (Admissions suspended)

#### Admission

Applicants must meet the admission requirements of the Graduate School. To qualify for a graduate assistantship in the department, an applicant must take the general and subject (one of the social science disciplines) tests of the Graduate Record Examination (GRE) and ordinarily have an undergraduate GPA of at least 3.0 on a scale of 4.0.

#### Degree Requirements

#### Major requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Courses from anthropology, economics, geography, government, psychology, sociology, United States history, and world civilization; at least one social studies methods course. Three courses must be 600-level.				15
Research requirement				
SS	694	Sem Cur Inst (1-5)		
<i>or</i>				
RES	697	Research Ppr (1-3)		
<i>or</i>				
THES	698	Thesis (1-6)	3-6	
Minors and electives				9-12
				30 hrs

## ANTHROPOLOGY

[www.bsu.edu/anthropology](http://www.bsu.edu/anthropology)

Burkhardt Building 315, 765-285-1575

*Chairperson:* S. Homes Hogue

*Graduate Committee:* Gail Bader, S. Homes Hogue

*Graduate Faculty:* Bader, Bowers, Boyd, Cochran, Coffin, Groover, Hicks, McCord, Merten, Nyce, Waite, Wohlt

#### PROGRAMS

## Master of arts (MA) in anthropology

### Admission

Applicants must meet the admission requirements of the Graduate School, meet a cumulative undergraduate minimum GPA of 2.75 on a 4.0 scale, and have the approval of the departmental graduate committee. The graduate committee bases its decisions on the applicant's undergraduate transcripts; Graduate Record Examination (GRE) scores; written recommendations; and a 300–500 word narrative detailing relevant background, reasons for wishing to undertake graduate study in this department, and the relationship of such study to long-term goals and interests in anthropology. Applicants whose undergraduate majors are not anthropology or closely related subjects may be required to complete undergraduate courses to acquire background knowledge. Credit for these courses does not apply to degree requirements. It is suggested that students wishing to focus on archaeology participate in a summer field school or have equivalent experience before beginning studies.

## MASTER OF ARTS IN ANTHROPOLOGY

### Degree Requirements

The minimum requirement for the MA in anthropology is 32 hours of graduate credit. Although students are encouraged to take general courses, they may focus on cultural and biological anthropology or archaeology. In keeping with the principle that students should have a broad knowledge of anthropology, core courses covering those three major subdisciplines are required; this requirement can be waived only by the graduate committee. In order for students to acquire an understanding of anthropology as a profession and a background in anthropological thought, ANTH 600 Graduate Studies Seminar and a course emphasizing method and/or theory are also required. A required 6-hour thesis permits students to specialize and acquire skills in research methods and techniques. Beyond these requirements, each student's plan of study will be tailored to individual needs.

### Required courses

Prefix	Number	Short Title	Course Credit Hrs	Program Required
ANTH	600	Grad Sem (1–2)	2	
ANTH	601	Scop Cultral	3	
ANTH	603	Scop Archaeo	3	
ANTH	605	Scop Biologi	3	
THES	698	Thesis (1–6)	6	
<i>3 hours from</i>				
Method and/or theory approved by graduate committee				3
<i>12 hours from</i>				
ANTH or other electives approved by graduate advisor				12
				32 hours

### Graduate Minor in Anthropology

Requires a minimum of 9 hours of approved anthropology courses. Students wishing to pursue a minor should contact the department chairperson before taking

any anthropology courses.

## **ANTHROPOLOGY (ANTH)**

**501 History of Method and Theory in Anthropology. (4)** Surveys the major ideas and issues of anthropology over time. Includes methods and theories from archaeology, biological anthropology, linguistics, and cultural anthropology. For students without a strong undergraduate background in anthropology.

*Not open to students who have credit in ANTH 301.*

**505 Topics in Biological Anthropology. (3)** Covers a variety of advanced current and special topics in biological anthropology, depending on students' interests and capacities. May be repeated for different topics.

*Prerequisite:* an introductory biological anthropology course or permission of the instructor.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**506 The Anthropology of Physical Growth and Development. (3)** Children's physical growth and development, its regulation, variation, and assessment in different times and places.

*Prerequisite:* an introductory physical anthropology course.

*Not open to students who have credit in ANTH 306.*

**507 Applied Anthropology. (3)** Investigates the problems and work that engage the attention of anthropologists outside the university setting. Examination of new skills needed to supplement those traditionally taught in anthropology.

*Not open to students who have credit in ANTH 307.*

**512 Ecological Dimensions of Culture. (3)** Explores the system of relationships between any human population and its environment, focusing on cultural behavior. Uses studies from ancient to modern times and models and theories from ecology and anthropology; considers both applied and theoretical perspectives.

*Prerequisite:* an introductory cultural anthropology course (waived for minors in environmentally sustainable practices) or permission of the instructor.

*Not open to students who have credit in ANTH 312.*

**515 Human Paleontology. (3)** Fossil record of the evolution of humans and their primate predecessors.

*Prerequisite:* ANTH 206 or equivalent or permission of the instructor.

*Not open to students who have credit in ANTH 315.*

**516 Human Osteology. (3)** Laboratory and lecture dealing with the human skeleton including identification of whole and fragmentary bones and the assessment of the age, stature, sex, and other traits of a skeleton as applied to paleodemography, paleopathology, and forensic problems.

*Prerequisite:* ANTH 206 or equivalent or permission of the instructor.

*Not open to students who have credit in ANTH 416.*

**521 Social Organization. (3)** Provides a systematic cross-cultural analysis of human organizations from kinship-based societies to modern bureaucracies. Using an evolutionary approach, provides both theoretical perspectives and applied understanding.

*Prerequisite:* ANTH 101, 111 or permission of the instructor.

*Not open to students who have credit in ANTH 321.*

**525 Evolutionary Adaptation and Human Diversity. (3)** Human biological variation in the contemporary world: examination of its distribution, inheritance, development, and adaptiveness.

*Prerequisite:* an introductory biological anthropology course or permission of the instructor.

*Not open to* students who have credit in ANTH 305.

**527 Culture and Medicine. (3)** Focuses on conceptions of health and illness from a cross-cultural perspective.

*Not open to* students who have credit in ANTH 427.

**529 Laboratory Methods in Material Culture. (3)** Addresses artifacts as reflections of culture. Focuses on ethnoarchaeology and experimental archaeology, as well as the integration of research design, recovery, identification, and laboratory analysis of artifacts from archaeological sites.

*Prerequisite:* ANTH 101, 103.

*Not open to* students who have credit in ANTH 329.

**530 Topics in Native North American Cultures. (3)** Topics in Native American cultures or study of Native American cultures of a particular region. May be repeated for different topics.

*Not open to* students who have credit in an undergraduate course covering the same topic.

**531 Native Americans of North America. (3)** Survey of cultures of North American Native Americans emphasizing their economic, socio-political, and religious institutions.

*Not open to* students who have credit in ANTH 331.

**532 Native Americans of the Great Lakes. (3)** In-depth study of selected Native American cultures indigenous to the Great Lakes region from the time of European contact to the contemporary period.

*Not open to* students who have credit in ANTH 332.

**534 Midwestern Archaeology. (3)** Archaeological development of the Midwest traced through the Paleo-Indian, Archaic, Woodland, and Mississippian stages.

*Prerequisite:* ANTH 103 or 204.

*Not open to* students who have credit in ANTH 334.

**537 Contemporary Problems of the Native Americans. (3)** Detailed study of current issues facing Native Americans. Particular issues facing tribes in specific regions and general issues of a pan-Native American nature will be covered.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

*Not open to* students who have credit in the corresponding undergraduate course in the same region.

**540 Anthropological Field Trip. (3–6)** Exposes students to lifeways of groups outside mainstream society whose lives and communities are significantly shaped by the policies of the larger society. Can be used for trips in various subfields of anthropology when appropriate.

*Prerequisite:* permission of the instructor.

A total of 6 hours of credit may be earned.

**541 Anthropology and Women. (3)** Development of the female phenotype; variation in the roles assigned in cultures of different levels of complexity, from gather-hunters to industrial societies—both Western and non-Western—and the contributions of women anthropologists to understanding this variation.

*Not open to* students who have credit in ANTH 341.

**542 American Culture. (3)** Examines how the values, beliefs, and norms of American culture are integrated into and symbolized in various media. Explores how Americans experience and resolve cultural tensions between individualism and community, equality and hierarchy, competition and cooperation.

*Not open to students who have credit in ANTH 342.*

**543 Historical Archaeology of Eastern United States. (3)** Explores primary historical processes and archaeologically significant trends in material culture that have shaped modern life since AD 1500.

*Not open to students who have credit in ANTH 343.*

**545 Archaeological Field School. (3–6)** Provides the practical application of archaeological methods, techniques, and strategies in a field setting. Participation in a supervised investigation of a formal archaeological problem at an actual archaeological site or at an experimental site.

*Prerequisite:* permission of the instructor.

A total of 6 hours of credit may be earned.

**550 Ethnographic Field School. (9)** An intensive immersion in the methods of field research in cultural anthropology. Emphasizes problem formulation, observation, interviewing, writing, and interpretation of field data. Field schools are intended to provide specific skills that result in an ethnographic report.

*Prerequisite:* ANTH 559; permission of the instructor.

**551 Witchcraft, Magic, and Religion. (3)** Anthropological study of humankind's age-old concern with life, death, sickness, and the unknown. Discusses human attempts to control life through supernatural beings, prayer, sacrifice, and techniques of magic and witchcraft.

*Not open to students who have credit in ANTH 451.*

**552 Anthropology of Technology. (3)** Reviews the anthropological literature on technology, focusing on cultural and comparative aspects of technology. This subfield's theoretical base and research methods will also be assessed.

*Not open to students who have credit in ANTH 452.*

**555 Primatology. (3)** Comparative survey of nonhuman primates, their biology and behavior.

*Prerequisite:* ANTH 206 or permission of the instructor.

*Not open to students who have credit in ANTH 455.*

**557 Applied Archaeology. (3)** Special problems of contract, conservation, and public archaeology, including laws and guidelines, relations with governmental and private agencies, research design and proposals, field and laboratory methods, and curation.

*Not open to students who have credit in ANTH 457.*

**559 Ethnographic Methods. (3)** Develops the ability to conduct and comprehend ethnographic research. Includes research design, data collection, analysis, reporting, basic statistics, and computer use. Emphasizes both quantitative and qualitative techniques for basic and applied research.

*Prerequisite:* 15 hours of ANTH courses or permission of the instructor.

*Not open to students who have credit in ANTH 459.*

**560 Topics in Ethnology. (3)** Considers special topics not covered by regular courses. One topic is studied in a semester. May be repeated for different topics.

*Not open to students who have credit in an undergraduate course covering the same topic.*

**563 Theory and Method in Historical Archaeology. (3)** Presents a detailed summary of theory and methods used by historical archaeologists, including social theory, historical methods, and archaeological analysis methods.

*Not open to students who have credit in ANTH 463.*

**564 European Prehistory. (3)** Prehistory of Europe from the Paleolithic through the Iron Age emphasizing the regions north and west of the classical world.

*Not open to students who have credit in ANTH 364.*

**570 Topics in Regional Ethnography. (3)** Considers the culture of a selected geographic area not covered by regular courses. May be repeated for different areas.

*Not open to students who have credit in an undergraduate course on the same geographic area.*

**571 Ethnohistory. (3)** Methods and theories of ethnohistory introduced by emphasizing how culture and history intersect with race, ethnicity, gender, class, and sexuality; a research-intensive class.

*Not open to students who have credit in ANTH 471.*

**577 Topics in Museum Operations. (3)** Introduces various aspects of museum operations, such as organization, financing, curation, exhibits, public interpretation, and conservation of collections. Emphasizes ethnographic and archaeological collections. May be repeated for different topics.

*Not open to students who have credit in ANTH 377.*

**580 Topics in Archaeology. (3)** Surveys archaeology of a selected region (e.g., Southwest) or focuses on a specialized area. May be repeated for different topics.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**581 Culture, Economy, and Development. (3)** Concerned with a culturally embedded view of allocation, conversion, production, distribution, and consumption of resources. Emphasizes economic development in third- and fourth-world countries both from theoretical and applied perspectives.

*Not open to students who have credit in ANTH 481.*

**582 Native Americans of the American Southwest. (3)** Surveys prehistoric, historic, and contemporary cultures of selected Southwest Native American groups. Emphasizes culture-specific solutions to problems perceived in their relationship to their natural and social environments.

*Not open to students who have credit in ANTH 482.*

**590 Topics in Cultural Change. (3)** Surveys from various perspectives the major concepts and processes of culture change, including globalization and its effects on cultures and individuals.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

*Not open to students who have credit in ANTH 460.*

**600 Graduate Studies Seminar. (1)** Introduction to the nature, purpose, and practice of scholarly inquiry in academic and applied environments. Includes exposure to major literature and research resources in the field, familiarization with professional culture and faculty resources, individual program design, and thesis planning.

A total of 2 hours of credit may be earned, but no more than 1 in any one semester or term.

**601 Scope of Cultural Anthropology. (3)** Overview of theory in cultural anthropology and its application to various conditions of recent and contemporary human society and culture.

*Prerequisite:* undergraduate anthropology major or minor, admission to anthropology graduate program or permission of the instructor.

**603 Scope of Archaeology. (3)** Overview of current archaeological research foci and interpretive frameworks in their historical context. Considers the relationship of archaeology to the other subdisciplines of anthropology and broader anthropological concerns.

*Prerequisite:* undergraduate anthropology major or minor, admission to anthropology graduate program or permission of the instructor.

**605 Scope of Biological Anthropology. (3)** Survey of the basic methods and theories of biological anthropology.

*Prerequisite:* undergraduate anthropology major or minor, admission to anthropology graduate program or permission of the instructor.

**690 Independent Study in Anthropology. (1–3)** Topics to be chosen and investigated in consultation with the instructor with special competence in the subject involved.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**695 Research Methods in Anthropology. (3)** An opportunity to use research techniques appropriate to one or more subfields of anthropology in developing a research model, gathering and analyzing data, and organizing the material in a research paper or report.

**696 Internship in Anthropology. (3–6)** On-the-job experience practicing anthropology for a period of five to ten weeks with an institution or agency.

A total of 6 hours of credit may be earned.

## BIOLOGY

[www.bsu.edu/biology](http://www.bsu.edu/biology)

Cooper Science Complex 121, 765-285-8820

*Chairperson:* Kemuel Badger

*Director of Doctoral Programs:* David Le Blanc

*Advisor of Master's Programs:* David Le Blanc

*Graduate Faculty:* Badger, Blakey, Bruns, Carter, Chatot, DeSouza, Dodson, Hammersmith, Islam, Lauer, LeBlanc, McDowell, McKillip, J. Mitchell, M. Mitchell, Olesen, Pyron, Rogers, Ruch, Vann

### PROGRAMS

Master of arts (MA) in biology; master of science (MS) in biology; doctor of education (EdD) in science education and doctor of philosophy (PhD) in science. Graduate minors in biology are also offered at the master's level. A biotechnology certificate is also available. The science and general science program requirements may be found in the Science section, [page 159](#).

See the Science listing under the College of Sciences and Humanities, [page 160](#), for the doctoral programs in science education and philosophy in science.

### MASTER'S PROGRAMS

#### Admission

Applicants must meet the admission requirements of the Graduate School and submit scores from the Graduate Record Exam (GRE). Students should have good backgrounds in the life sciences, chemistry, mathematics, and physics and baccalaureate degrees with majors or minors in biology or the equivalent. Exceptions may be made by petition to the department. Students entering without adequate background are expected to make up the deficiencies during their first year.

### Professionalization of a Teaching License

Any of the master's programs may be used to convert a standard-grade teaching license to a professional-grade teaching license. Teachers working toward professional certification must complete a 9-hour professional education component, which includes at least one of the following: BIO 691, 694, PHYCS 691, or SCI 696. The BIO, PHYCS, or SCI hours may count toward the major area, the other hours as minor and elective hours toward the total of 30 hours.

### MASTER OF ARTS IN BIOLOGY

Designed to strengthen the student's background in biological sciences and related disciplines through course work at the graduate level; there is no research thesis requirement. Prepares students for jobs in biomedical laboratories, natural resource management agencies, scientific supply firms, environmental consulting firms, and scientific publishing firms, as well as for further education.

#### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Approved courses from BIO, BIOT, BOT, ZOOL, and SCI				
CRPRJ	698	Creat Proj (3 or 6)		
<i>or</i>				
RES	697	Research Ppr (1-3)		
<i>or</i>				
BIOT	596	Res Des/Pres (2)		
<i>and</i>				
BIOT	590	Recomb Techn (3)		
<i>or</i>				
SCI	699	Res Mth Ed (3)		16-30
Minors and electives				0-14
				30 hrs

Minors are optional, but if taken must include at least 8 hours of courses approved by a designated advisor from the minor area and the biology department.

### MASTER OF SCIENCE IN BIOLOGY

Includes both graduate course work and extensive research experience culminating in a research thesis. It is designed to prepare students for further study at the doctoral level, but graduates may also find employment in research-oriented activities of government agencies or private business firms.

#### Degree Requirements

## Major requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Approved courses from BIO, BOT, ZOOL, SCI				
THES	698	Thesis (1-6)		16-30
Minors and electives				0-14
				30 hrs

Minors are optional, but if taken must include at least 8 hours of courses approved by a designated advisor from the minor area and the biology department.

**GRADUATE MINOR IN BIOLOGY**

Requires 8 or more hours of approved BIO, BOT, and ZOOL courses.

**BIOTECHNOLOGY CERTIFICATE**

Prefix	Number	Short Title	Course Credit Hrs	Program Required
BIOT	590	Recomb Techn	3	
BIOT	591	Th/App PCR	3	
BIOT	592	Prot Iso Ana	3	
BIOT	593	Prof Dev	1	
BIOT	594	Cell Culture	2	
BIOT	595	Seq/Bioinfo	2	
BIOT	596	Res Des/Pres	2	
Electives 6-7 hours from				
BIO	546	App Microbio (3)		
BIO	548	Biometry (3)		
BIO	552	Adv Genetics (3)		
BIO	553	Human Genetc (3)		
BIO	554	Genomes (3)		
BIO	556	Cancer Bio (3)		
BIO	557	Molecular (4)		
BIO	570	Develop Biol (4)		
BIO	631	Virology (4)		
BIO	641	Med Bact (3)		6-7
BIO				
1-6 hours from				
BIO	669	Intern Bio (1-6)		
BIO	694	Pract Sci Ed (1-6)		
BIO	697	Research (1-3)		
RES	697	Research Ppr (1-3)		1-6
				23-29 hrs

## BIOLOGY (BIO)

**501 Developments in Modern Biology. (3–6)** Stresses recent discoveries in biology and integrates and enhances understanding of basic principles of the discipline.

A total of 6 hours of credit may be earned.

**516 Population Ecology. (3)** Presents fundamental principles of population growth and regulation, including both with-species and between-species interaction. Implications for over-population, endangered species, and pest and game management are discussed. Laboratory includes both experimental studies and computer simulation exercises.

*Prerequisite:* BIO 216.

*Not open to* students who have credit in BIO 416.

**518 Community and Ecosystem Ecology. (3)** Principles of ecological organization at the community and ecosystem levels. Emphasizes the processes that influence the structure and function of communities and ecosystems. Laboratory includes field and lab studies of plant and animal systems.

*Prerequisite:* BIO 216.

*Not open to* students who have credit in BIO 418.

**520 Field Biology of Distant Areas. (3–12)** The species peculiar to selected geographic areas. Ecology, flora, and fauna. Travel may be by air. Seminars may be scheduled regularly throughout the course. Registration fee may include travel charges as well as the general fee.

*Prerequisite:* permission of the department chairperson.

A total of 12 hours of credit may be earned.

**540 Evolution. (3)** Principles, evidence, and the historical context of modern evolution theory. Some attention will be given to the origin of life and the evolution of plants and animals.

*Not open to* students who have credit in BIO 440.

**546 Applied Microbiology. (3)** Study of microorganisms that effect beneficial and detrimental changes in foods (including milk and milk products) and industrial fermentations.

*Prerequisite:* BIO 313 or permission of the department chairperson.

*Not open to* students who have credit in BIO 446.

**548 Biometry. (3)** Principles and applications of statistics to biological problems. The use of parametric and nonparametric tests of significance in the analysis of data and the interpretation of experiments.

*Prerequisite:* MATHS 108 or its equivalent or permission of the department chairperson.

*Not open to* students who have credit in BIO 448.

**552 Advanced Genetics. (3)** Bacterial and eukaryotic genetics with emphasis on recent developments in molecular genetics. Topics include alternative structures of DNA, mechanisms of DNA replication, mutagenesis, DNA rearrangements, regulation of gene expression, RNA processing, and molecular and mutagenetic analysis of the cell cycle.

*Prerequisite:* BIO 214; CHEM 231.

*Not open to* students who have credit in BIO 452.

**553 Human Genetics and the Problems of Humankind. (3)** Current developments in human heredity. Human chromosome aberrations. DNA, the genetic code, and mutations. Consanguineous marriages and genetic defects. Mendelian principles applied to humans. Pedigrees and probability. Genetic screening and counseling. Social, ethical, and legal problems and advances in genetics.

*Prerequisite:* BIO 214 or permission of the instructor or department chairperson.

*Not open to students who have credit in BIO 453.*

**554 Development and Evolution of Genomes: Genomics and Proteomics. (3)** Analysis of the development, expression, and evolution of genomes through the examination of genomics and proteomics. Attempts to explore the theoretical basis of developing technologies to provide models for application to current questions in biological systems from the cellular or organismal levels by treatment of the genome as a system.

*Prerequisite:* BIO 214, 215; or permission of the instructor.

*Not open to students who have credit in BIO 454.*

**556 Cancer Biology. (3)** Examination of the biological basis of cancer, discussion of related contemporary issues, and overview of recent advances in cancer research. Emphasis on cancer progression, tumor production, etiology/epidemiology, prevention, modern therapies, and patient management.

*Prerequisite:* BIO 215, its equivalent, or permission of the department chairperson.

**557 Molecular Biology. (4)** Structure and function of macromolecules in living things. Emphasizes three-dimensional structures; models for enzyme mechanisms, DNA replication; protein synthesis and membrane function; and applications of biotechnology.

*Prerequisite:* BIO 215 or the equivalent, or permission of the department chair-person.

*Not open to students who have credit in BIO 457.*

**560 Microtechniques. (4)** A lecture/lab course in the preparation of biological material for microscopic examination in teaching, research, and clinical applications. Emphasizes preparation of smears, squashes, whole mounts, paraffin, and frozen plant and animal sections, and photomicrography.

*Not open to students who have credit in BIO 460.*

**570 Developmental Biology. (4)** Recent advances and theories in early embryogenesis and developmental biology. Major emphasis on genetic and molecular mechanisms operating during developmental phenomena. Topics include fertilization, mosaic versus regulative development, regulation of gene expression, patterning, germ line and sex determination, and neoplasia. Lecture and laboratory.

*Prerequisite:* BIO 215 or equivalent or permission of the department chairperson.

*Not open to students who have credit in BIO 470.*

**580 Limnology. (3)** The physical, chemical, and biological characteristics of inland waters. Laboratory time and several field trips will be devoted to exploring techniques for the evaluation of representative aquatic ecosystems.

*Prerequisite:* BIO 216 or permission of the department chairperson.

*Not open to students who have credit in BIO 480.*

**582 Aquatic Microbiology. (3)** Microorganisms indigenous to nonpolluted and polluted aquatic ecosystems. Emphasizes nutrient cycling and the use of microorganisms as indicators of pollution. Morphology, physiology, and ecology of specific organisms. Lecture and laboratory.

*Prerequisite:* BIO 313.

*Not open to students who have credit in BIO 482.*

**583 Marine Biology. (3)** Introduction to marine environments. Properties of seawater, hydrodynamics. Phyto-plankton and benthic plants. Primary production, nutrient cycles. Marine animals, surveys of major taxa. Adaptations for life on the bottom, open water, intertidal zones, estuaries, and abyssal regions. Problems of overexploitation and pollution.

*Not open to students who have credit in BIO 483.*

**592 Bioethical Decision Making. (3)** Development of decision-making skills through the analysis and personal resolution of bioethical problems created by the application of new biological and biomedical knowledge and technologies.

*Not open to students who have credit in BIO 492.*

**628 Readings in Biology. (1–3)** Directed readings for majors in biology. Individualized program of readings developed under the supervision of a faculty member.

*Prerequisite:* permission of the department chairperson.

A total of 3 hours of credit may be earned.

**629 Seminar in Biology. (1)** Review and discussion of the literature related to selected topics of current interest in biological research.

*Prerequisite:* permission of the department chairperson.

A total of 2 hours of credit may be earned, but no more than 1 in any one semester or term.

**631 Virology. (4)** An in-depth study of viruses, including animal, plant, insect, and bacteria viruses. Topics include the physical and chemical properties of viruses, virus–host interactions, and pathogenesis. In addition to the lecture component, a weekly discussion of journal articles emphasizing virology-based experimental assays will also be required.

*Prerequisite:* cell biology and one course in microbiology, or by permission of the instructor or department chairperson. Familiarity with immunology is preferred.

**636 Immunology. (4)** A study of the components of the immune system and immune responses with particular emphasis on immune-related diseases. Topics include hematopoiesis, cellular interactions, immunochemistry, immunogenetics, and immune regulation and tolerance. The lab component will emphasize immunology-based assays and include journal article discussions concerning immunology topics.

*Prerequisite:* cell biology and one course in microbiology, or by permission of the instructor or department chairperson.

**641 Medical Bacteriology. (3)** Study of pathogenic bacteria with emphasis on morphology and physiology. Laboratory techniques in culturing, isolating, and identifying bacteria.

*Prerequisite:* BIO 313; CHEM 231.

*Not open to students who have credit in BIO 341.*

**642 Medical Microbiology. (8)** Microbiology for medical students with consideration of bacteria, fungi, viruses, and parasites as agents in human disease and the immunological and serological aspects of the host–parasite relationship.

*Open only to* medical students or by permission of the department chairperson.

**653 Medical Genetics. (2)** Genetics for medical students: basic genetic principles, human cytogenetics, molecular genetics, genetic epidemiology; probability, population and quantitative (multifactorial) genetics; dermatoglyphics, etiology of birth defects, inborn metabolic disorders, genetic screening and counseling, genetics of mental illness and cancer, pharmacogenetics, immunogenetics, and genetic engineering.

*Open only to* medical students or by permission of the department chairperson.

**655 Cell Biology. (4)** Biology of the cell, including cell morphology, bioenergetics, enzyme function, cell environment, membrane structure and function, cell metabolism, and cell differentiation and growth.

*Prerequisite:* CHEM 360.

*Not open to students who have credit in BIO 215.*

**669 Internship in Biology. (1–6)** Paid, supervised field and laboratory experience in public or private agencies (or in the Department of Biology). Training involves application of biological principles in the work environment.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.

**691 Developments in Biology Education. (3)** Origin, content, emphasis, and objectives of recent curriculum developments and philosophical approaches to teaching science in the secondary school. Student activities include presentation of current topics and creation of instructional materials that incorporate the most current techniques.

*Prerequisite:* an undergraduate major or minor in science.

**694 Practicum in Science Education. (1–6)** Science curricula and instruction in classroom situations. Needs assessment in science education from the point of view of inservice teachers and their students. Staff consultation in implementation of improved science programs.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.

**697 Research in Biology. (1–3)** Independent research for biology majors at the master's level. Students' research projects must be developed in consultation with a faculty member. As much as 3 hours of credit may be applied toward a master's degree.

*Prerequisite:* permission of the department chairperson.

A total of 3 hours of credit may be earned.

**796 Research in Biology. (1–6)** Independent research for biology majors at the doctoral level. Students' proposed research projects must be developed in consultation with a faculty member.

*Prerequisite:* permission of the department chairperson.

A total of 8 hours of credit may be earned, but no more than 6 in any one semester or term.

## **BIOTECHNOLOGY (BIOT)**

**590 Introduction to Recombinant DNA and RNA Techniques. (3)** Study of the fundamental methods and approaches used in biotechnology with experiences in recombinant DNA and RNA techniques. Emphasis on theory and practice of commonly used scientific techniques, experimental design, and reading and analysis of scientific literature.

*Prerequisite:* BIO 215 or 655.

*Not open to* students who have credit in BIOT 490.

**591 Theory and Applications of the Polymerase Chain Reaction. (3)** Study of the theory of the polymerase chain reaction and its standard applications in research. Emphasis on experimental design and optimization of reactions, applications in DNA and RNA analysis, differential display, site-directed mutagenesis, and subcloning of PCR products.

*Prerequisite:* BIO 215 or 655.

*Not open to* students who have credit in BIOT 491.

**592 Protein Isolation and Analysis. (3)** Study of the theory and application of techniques involved in protein isolation, characterization, and analysis. Emphasis on understanding principles of protein purification, laboratory experiences in protein separation, detection and analysis of structure function relationships.

*Prerequisite:* BIO 215 or 655.

*Not open to* students who have credit in BIOT 492.

**593 Professional Development in Biotechnology. (1)** Emphasizes curriculum vita development. Provides employment counseling, discussion of job ethics and values, information on laboratory set-up, and job interview strategies.

*Not open to students who have credit in BIOT 493.*

**594 Cell Culture Techniques. (2)** Study of the practice and theory of cell and tissue culture. Emphasis on the application of basic concepts and techniques to the in vitro culture of many different cell types.

*Prerequisite:* BIOT 590.

*Not open to students who have credit in BIOT 494.*

**595 DNA Sequencing and Bioinformatics. (2)** Covers the determination of DNA nucleotide sequence and Internet/software utilization of DNA and protein databases for sequence analysis.

*Prerequisite:* BIOT 590.

*Not open to students who have credit in BIOT 495.*

**596 Research Design and Presentation. (2)** Emphasizes improvements in oral and written communication skills, and development of an independent research proposal.

*Prerequisite:* BIOT 590.

*Not open to students who have credit in BIOT 496.*

## **BOTANY (BOT)**

**540 Taxonomy of Vascular Plants. (4)** Identification, use, and care of native and ornamental trees, shrubs, vines, and herbaceous plant material. The use of botanical keys, manuals, and texts in the identification of plant taxa.

*Prerequisite:* BIO 112 or permission of the department chairperson.

*Not open to students who have credit in BOT 440.*

**542 Economic Botany. (3)** The cultivation, processing, environmental requirements, and use of plants and plant derivatives for food, drugs, dwellings, clothing, and power.

*Not open to students who have credit in BOT 442.*

**544 Plant Propagation and Management. (3)** Practical experience in the different methods of plant propagation, care, and cultivation for use in the home, school, garden, and greenhouse. Diseases, pathogens, and pests of the plant.

**546 Medical Mycology. (3)** Study of fungi with emphasis on pathogenic forms. Methods of identification of fungi will be discussed along with morphology and biochemistry of fungi.

*Prerequisite:* BIO 313.

*Not open to students who have credit in BOT 446.*

**551 Plant Physiology. (4)** An introductory treatment of the physiological activities of green plants with emphasis on plant growth substances, photosynthesis, and intermediate metabolism.

*Prerequisite:* BIO 112; CHEM 231.

*Not open to students who have credit in BOT 451.*

**560 Plants and Their Allies. (4)** Evolutionary-phylogenetic survey of plant forms. Includes bacteria, algae, fungi, bryophytes, and vascular plants. Emphasizes comparative morphology and anatomy, reproductive structures, cycles, and adaptations to varying habitats.

*Prerequisite:* BIO 111, 112.

**570 Dendrology. (3)** The identification and site characterization of woody plants with emphasis on midwestern tree species. Use of botanical features and keys in field identification. Correlation of species with site conditions, plant diseases, climatic parameters, associate species, and geographical distribution.

*Prerequisite:* BIO 112 or permission of the department chairperson.

*Not open to* students who have credit in BOT 470.

**580 Plant Ecology. (3)** Factors affecting the distribution and abundance of plants. Patterns, structure, and development of plants at the individual, population, and community levels. Laboratory provides experience with ecological experimentation at the physiological, population, and community levels.

*Prerequisite:* BIO 216 or permission of the instructor.

**581 Aquatic Botany. (4)** The collection and identification of nonvascular and vascular plants from fresh water ecosystems. Emphasizes morphology, physiology, and ecology of these plants to explain their distribution in nature. Class project and field trips may be used to demonstrate ecological relationships.

*Prerequisite:* BIO 112 or permission of the department chairperson.

*Not open to* students who have credit in BOT 481.

## SCIENCE (SCI)

**501 Electron and Confocal Microscopy. (3)** Introduction to the techniques and theory of electron and confocal microscopy. Emphasizes basic procedures employed in specimen preparation, production of micrographs and operation of the transmission, scanning, and confocal microscopes.

**690 Workshop in Science Education. (1–12)** Practical experience with teaching science at specific level (early childhood, elementary, middle, secondary, or higher education) and/or specific topic (e.g., chemistry or geology). May be repeated for different level and/or topic.

*Prerequisite:* teaching experience or certification or permission of the instructor.

A total of 24 hours of credit may be earned, but no more than 12 in any one semester or term.

**695 Advanced Teaching Methods in Science. (3–6)** Recent developments in science teaching at specific level (early childhood, elementary, middle, secondary, or higher education) and/or specific topic (e.g., biology or physics). May be repeated for different level and/or topic.

*Prerequisite:* teaching experience or certification or permission of the instructor.

A total of 6 hours of credit may be earned.

**696 Current Issues in Science Education. (3–6)** Current research and theory of teaching science at specific level (early childhood, elementary, middle, secondary, or higher education) and/or specific science topic (e.g., chemistry or geology). May be repeated for different level and/or topic.

*Prerequisite:* permission of the instructor.

A total of 6 hours of credit may be earned.

**699 Research Methodology in Science Education. (3)** Identification of research problems in science and science education. Introduction to types of research, research design, and grantwriting. Review of literature pertinent to a special topic of student interest. Development of a research proposal.

*Prerequisite:* permission of the department chairperson.

**790 Internship in Science Education. (1–4)** Supervised experience in instruction of science or science education courses.

*Prerequisite:* permission of the department chairperson.

A total of 4 hours of credit may be earned.

**ZOOLOGY (ZOOL)**

**532 Invertebrate Zoology. (4)** Comparative morphology, physiology, ecology, life histories, and phylogeny of invertebrate animal phyla.

*Prerequisite:* BIO 111, 112, or permission of the department chairperson.

*Not open to students who have credit in ZOOL 432.*

**540 Ornithology. (3)** The study of birds including identification, systematics, anatomy, physiology, life histories, ecological relationships, and conservation. Fieldwork in addition to regular laboratory periods may be required.

*Not open to students who have credit in ZOOL 440.*

**541 Entomology. (3)** Anatomy, physiology, taxonomy, life histories, habits, and adaptations of insects.

*Prerequisite:* BIO 111, 112, or permission of the department chairperson.

*Not open to students who have credit in ZOOL 441.*

**544 Ichthyology. (3)** The study of fish with emphasis on identification, classification, anatomy and physiology, and ecology. Emphasizes Indiana species but includes other important species.

*Prerequisite:* BIO 111, 112, or permission of the department chairperson.

*Not open to students who have credit in ZOOL 444.*

**545 Herpetology. (3)** Introduction to the biology of amphibians and reptiles, including their origin, anatomy, physiology, classification, behavior, and ecology. Through extensive field trips, the laboratory will emphasize identification and observation of amphibians and reptiles in their natural habitats.

*Prerequisite:* BIO 112.

*Not open to students who have credit in ZOOL 445.*

**546 Mammalogy. (3)** The evolutionary origin, characteristics, and distribution of recent mammals. The economic relationships of mammals. The collection and preservation of specimens. May require additional fieldwork.

*Not open to students who have credit in ZOOL 446.*

**565 Fishery Resources Management. (3)** The relationship of fisheries to other natural resources; a survey of aquatic habitats and the characteristics of fish that affect their management; basic principles, practices, and techniques of management of inland waters for fish production.

*Prerequisite:* BIO 216 or permission of the department chairperson.

*Not open to students who have credit in ZOOL 465.*

**583 Wildlife Biology. (3)** The identification, population dynamics, and geographic distribution of wildlife species with particular emphasis on those of the United States. The harvest and management of wildlife. May require additional fieldwork.

*Prerequisite:* BIO 216 or permission of the department chairperson.

*Not open to students who have credit in ZOOL 483.*

**584 Aquatic Entomology. (3)** Immature and adult stages of aquatic insects, including collecting techniques, identification, ecological requirements, morphology, and evolutionary adaptations to lentic and lotic conditions. Emphasizes aquatic insects as indicators of environmental quality and stress.

*Prerequisite:* ZOOL 541 or permission of the department chairperson.

*Not open to students who have credit in ZOOL 484.*

**670 Field Zoology. (3)** The field study of animals—terrestrial and aquatic, invertebrate and vertebrate, microscopic and macroscopic—with emphasis on the collection and identification of noninsect invertebrates.

**682 Animal Ecology. (3)** The composition, development, dynamics, and geographic distribution of animal communities. The relationships between animals and the physical, chemical, and biotic elements of the environment. Includes physiological ecology and ethology. Field studies of animal communities.

## CHEMISTRY

[www.bsu.edu/chemistry](http://www.bsu.edu/chemistry)

Cooper Science Complex 305, 765-285-8060

Chairperson: Patti Lang

Graduate Advisor: Patti Lang

Graduate Faculty: Bock, Lang, Pattison, Poole, Sammelson, Sousa, Storhoff

### PROGRAMS

Master of Arts (MA) in Chemistry and Master of Science (MS) in Chemistry

See the Science listing under the College of Sciences and Humanities, page 160, for doctoral programs in science education and philosophy in science.

### Admission

Applicants must meet the admission requirements of the Graduate School and should have satisfactory Graduate Record Examination (GRE) verbal and quantitative scores.

### MASTER OF ARTS IN CHEMISTRY

Prefix	Number	Short Title	Course Credit Hrs	Program Required
<i>Chemistry option</i>				
CHEM	500	Chem Comunic	1	
CHEM	563	Prn Biochm 1	3	
CHEM	626	Adv Analytic	3	
CHEM	636	Adv Org Chem	3	
CHEM	646	Adv Phy Chem	3	
CHEM	651	Adv Inorgan	3	
CHEM	673	Seminar	1	
Graduate chemistry courses approved by the graduate advisor				9
Research requirements 4 hours from				
CHEM	670	Resrch Chem (1-7)		
CHEM	696	Resrch Meth (2)		
RES	697	Research Ppr (1-3)		4
				30 hrs

Prefix	Number	Short Title	Course Credit Hrs	Program Required
<i>Chemical Education option</i>				
CHEM	500	Chem Comunic	1	
CHEM	563	Prn Biochm 1	3	
CHEM	626	Adv Analytic	3	
CHEM	636	Adv Org Chem	3	
CHEM	646	Adv Phy Chem	3	
CHEM	651	Adv Inorgan	3	
CHEM	673	Seminar	1	
Graduate chemistry courses approved by the graduate advisor				9
Research requirements 4 hours from				
CHEM	671	Resrch Ch Ed (1-7)		
CHEM	696	Resrch Meth (2)		
RES	697	Research Ppr (1-3)		4
				30 hrs

### MASTER OF SCIENCE IN CHEMISTRY

Prefix	Number	Short Title	Course Credit Hrs	Program Required
<i>Chemistry option</i>				
CHEM	500	Chem Comunic	1	
CHEM	563	Prn Biochm 1	3	
CHEM	626	Adv Analytic	3	
CHEM	636	Adv Org Chem	3	
CHEM	646	Adv Phy Chem	3	
CHEM	651	Adv Inorgan	3	
CHEM	673	Seminar	1	
Research requirements				
CHEM	670	Resrch Chem (1-7)		7
THES	698	Thesis (1-6)		6
				30 hrs
<i>Chemical Education option</i>				
CHEM	500	Chem Comunic	1	
CHEM	563	Prn Biochm 1	3	
CHEM	626	Adv Analytic	3	
CHEM	636	Adv Org Chem	3	
CHEM	646	Adv Phy Chem	3	
CHEM	651	Adv Inorgan	3	
CHEM	673	Seminar	1	
Research requirements				
CHEM	671	Resrch Ch Ed (1-7)	7	
THES	698	Thesis (1-6)	6	
				30 hrs

These programs are designed for students who hold bachelor of science or bachelor of arts degrees in chemistry, including at least one year of calculus-based physical chemistry. Students with substantial backgrounds (e.g., those who have completed at least ACS-certified bachelor's degrees or work beyond the bachelor's level) may have one or more of the core course requirements waived, but the minimum number of 30 hours required for graduation still applies. These students should discuss the possibilities with the chemistry graduate advisor.

Students with substantial chemistry backgrounds but who have undergraduate degrees in such other disciplines as biology, medical technology, premedicine, or predentistry may be admitted to the graduate program to begin some graduate course work while making up undergraduate deficiencies. However, courses taken to remove undergraduate deficiencies cannot be applied to total graduate hours. These students should discuss their situations with the chemistry graduate advisor to determine whether their backgrounds are sufficient to begin graduate work in chemistry.

## CHEMISTRY (CHEM)

**500 Chemical Communications. (1)** Use of scientific literature, sources, and classification systems, and current and retrospective searches in the specialized branches of chemistry.

*Prerequisite:* 20 hours of chemistry or permission of the department chairperson.

*Not open to* students who have credit in CHEM 400.

**520 Chemical Instrumentation 1. (3)** Theoretical principles and applications of selected spectroscopic, electro chemical, and chromatographic methods, with illustrative experiments. Two hours of lecture and one three-hour laboratory period weekly.

*Prerequisite:* CHEM 225, 344 or 340 or permission of the department chairperson.

*Not open to* students who have credit in CHEM 420.

**521 Chemical Instrumentation 2. (3)** Advanced treatment of selected topics in spectroscopy, electrochemistry, and chromatography. Introduction to mass spectroscopy, nuclear methods, and thermal and surface analysis. Three hours of lecture weekly.

*Prerequisite:* CHEM 520 or permission of the department chairperson.

**525 Instrumental Methods of Analysis. (3)** Practical applications of modern chemical instrumentation: electrometric, chromatographic, and spectroscopic methods. For chemical/medical technologists or departmental minors. Two hours of lecture and one three-hour laboratory weekly.

*Prerequisite:* CHEM 225.

*Not applicable to* MS or MA degree programs in chemistry.

*Not open to* students who have credit in CHEM 325.

**530 Organic Laboratory Techniques. (2)** Laboratory course that includes multi-step syntheses of organic compounds, their isolation, purification, and characterization using modern spectroscopic and chromatographic techniques. Six hours of laboratory weekly.

*Prerequisite:* CHEM 232 or its equivalent.

*Not open to* students who have credit in CHEM 430.

**540 Selected Principles of Physical Chemistry. (3)** Introduction to the properties of solids, liquids, gases, and solutions and to the basic concepts of thermodynamics and kinetics. Especially for premedical, biology, and general science majors, chemistry teaching majors, and chemistry minors. Two hours of lecture and one three-hour recitation/laboratory period weekly.

*Prerequisite:* CHEM 225; MATHS 161.

*Not open to* students who have credit in CHEM 340, 344, or 544.

**544 Physical Chemistry 1. (4)** Thermodynamic and structural description of chemical processes and properties of solids, liquids, gases, and solutions. Three hours of lecture and one three-hour laboratory period weekly.

*Prerequisite:* CHEM 235 or 232; MATHS 166; one year of college physics.

*Not open to* students who have credit in CHEM 344.

*Cannot be used* for credit by a candidate for the master of science degree with chemistry as a major.

**545 Physical Chemistry 2. (4)** Continuation and extension of CHEM 544. Topics include reaction kinetics, theoretical facets of quantum mechanics, and spectroscopy. Three hours of lecture and one three-hour laboratory period weekly.

*Prerequisite:* CHEM 344 or 544.

*Not open to* students who have credit in CHEM 345.

*Cannot be used* for credit by a candidate for the master of science degree with chemistry as a major.

**550 Inorganic Chemistry. (4)** Chemistry of the elements, including the relationships of chemical properties and atomic and molecular structure, chemical bonding, acid-base theories, chemical periodicity, and modern theories of coordination compounds. Four hours of lecture weekly.

*Prerequisite:* CHEM 232 or 235 or 360; MATHS 161 or 165.

*Not open to* students who have credit in CHEM 450.

**560 Essentials of Biochemistry. (4)** Organic chemistry of carboxylic acids, amines, and their derivatives; biochemistry of proteins, carbohydrates, lipids, and nucleic acids; metabolism and the regulation of metabolic processes. For students in life sciences, dietetics, and medical technology. Three hours of lecture and one three-hour laboratory session weekly.

*Prerequisite:* CHEM 231 or the equivalent.

*Not applicable to* MS or MA degree programs in chemistry.

*Not open to* students who have credit in CHEM 360 or 463 or 563.

**563 Principles of Biochemistry 1. (3)** Chemistry of proteins, enzymes, nucleic acids, carbohydrates, and lipids. For chemistry, life sciences, and premedicine majors. Three hours of lecture weekly.

*Prerequisite:* CHEM 232 or 235.

*Not open to* students who have credit in CHEM 463.

**564 Principles of Biochemistry 2. (3)** Continuation and extension of CHEM 563 including biological oxidations and energy transfers; metabolism of carbohydrates, lipids, proteins, and nucleic acids; and regulation of metabolic processes. Three hours of lecture weekly.

*Prerequisite:* CHEM 463 or 563.

*Not open to* students who have credit in CHEM 464.

**575 Exploration of Selected Topics in Chemistry. (1–3)** Discussion or written reports or both in advanced special topics in or related to chemistry. Examples are topics in neurochemistry, physical organic, chemical synthesis, kinetics, spectroscopy, etc.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**626 Advanced Analytical Chemistry. (3)** Survey of modern analytical chemistry. Topics include sampling, wet chemical techniques, nonaqueous systems, and contemporary research and applications in chromatography, spectroscopy, and electrochemistry. Three hours of lecture weekly.

*Prerequisite:* CHEM 225 or the equivalent.

**636 Advanced Organic Chemistry. (3)** Topics include nomenclature, bonding, acids and bases, stereochemistry, structure– reactivity relationships, and mechanisms of important reactions. Introduction to synthesis, the disconnect approach, synthons, protecting groups, and functional group interconversions.

*Prerequisite:* CHEM 232 or 235 or the equivalent.

**646 Advanced Physical Chemistry. (3)** Survey of physical chemical principles with emphasis on practical applications. Topics include thermodynamics, reaction kinetics, and selected quantum chemical applications.

*Prerequisite:* CHEM 345 or its equivalent.

**651 Advanced Inorganic Chemistry. (3)** Continuation of CHEM 550. Current theories of bonding in coordination chemistry. Descriptive and theoretical treatments of the chemistry and structure of transition metal complexes, organometallic compounds, fluxional molecules, and metal clusters; the importance of metals in biological systems. Three hours of lecture weekly.

*Prerequisite:* CHEM 450, 340 or 344.

**667 Medical Biochemistry. (6)** Chemistry of major cellular constituents; enzymes as the catalysts of intracellular chemical reactions with emphasis on underlying principles of physical and organic chemistry. Intermediary metabolism of carbohydrates, lipids, amino acids, and nucleotides; modern techniques employed in the study of metabolic processes; biosynthesis and degradation of intracellular components; hormonal regulation of metabolism.

*Prerequisite:* admission to the medical education program.

**670 Research in Chemistry. (1–7)** Original work at the molecular level on projects based in the current scientific literature. The projects will be directed by graduate faculty and will typically involve aspects of ongoing research.

*Prerequisite:* permission of the department chairperson.

A total of 7 hours of credit may be earned.

**671 Research in Chemical Education. (1–7)** Original work based on the current science education literature. Projects will be directed by graduate faculty and may involve conducting surveys, developing new instructional materials or methods, or evaluating the effectiveness of technology-based teaching.

*Prerequisite:* permission of the department chairperson.

A total of 7 hours of credit may be earned.

**673 Seminar in Chemistry. (1)** Critical examination and discussion of recent experimental and theoretical developments in chemistry.

*Prerequisite:* CHEM 400 or 500; permission of the department chairperson.

**675 Advanced Topics in Chemistry. (1–3)** Discussion, experimentation, or both in specialized topics for the qualified advanced student. Information concerning specific topics offered during a given semester may be obtained from the departmental office. Lecture and laboratory schedules appropriate to the topics offered.

*Prerequisite:* permission of the department chairperson.

A total of 3 hours of credit may be earned.

**690 Contemporary Instruction and Curricula in Chemistry. (2–4)** Designed to make the inservice chemistry teacher familiar with management of large-group instruction, development and implementation of multimedia materials in instructional schemes, use of videotape in the laboratory, and facility design

for modular and other systems. Field trips to nearby schools to study facility design may be included. Two hours of lecture weekly.

*Prerequisite:* permission of the department chairperson.

A total of 4 hours of credit may be earned.

**696 Chemistry Research Methods. (2)** Introduction to use of scientific literature, design of research experiments, specialized techniques, and writing skills endemic to the specialized fields of chemistry. Class and laboratory experience appropriate to students' specializations.

*Prerequisite:* CHEM 400 or 500; permission of the department chairperson.

**770 Research in Chemistry. (1–12)** In-depth original work at the molecular level on projects based in the current scientific literature. The projects will be directed by graduate faculty and will typically involve aspects of ongoing research.

*Prerequisite:* permission of the department chairperson.

A total of 12 hours of credit may be earned.

**771 Research in Chemical Education. (1–12)** In-depth original work based on the current science education literature. Projects will be directed by graduate faculty and may involve conducting surveys, developing new instructional materials or methods, or evaluating the effectiveness of technology-based teaching.

*Prerequisite:* permission of the department chairperson.

A total of 12 hours of credit may be earned.

**773 Chemistry and Chemical Education Seminar. (1–3)** In-depth analyses of recent trends and developments in chemistry or chemical education. Seminar participants report on assigned topics to departmental groups.

*Prerequisite:* permission of the department chairperson.

A total of 3 hours of credit may be earned.

## COMPUTER SCIENCE

[www.bsu.edu/cs](http://www.bsu.edu/cs)

Robert P. Bell Building 455, 765-285-8641

*Chairperson:* Paul Buis

*Graduate Program Advisor:* Fu-Shing Sun

*Graduate Faculty:* Bagga, Buis, Gestwicki, Hsieh, Luer, McGrew, Nelson, Owens, Sun, Tanksale, Tzeng, D. Zage, W. Zage, Zhang

### Programs

The Master of Science (MS) degree is primarily for students with undergraduate degrees in computer science who plan to undertake further graduate study or apply computer science in a variety of fields. A minor in computer science is also offered.

See the Science listing under the College of Sciences and Humanities, [page 160](#), for the doctoral programs in science education and philosophy in science.

### Admission

In addition to meeting the admission requirements of the Graduate School, applicants must have departmental approval for admission. Applicants must submit three letters of recommendation, a one-page

statement of educational goals, and scores from the Graduate Record Examination (GRE). Students without an adequate computer science background will be required to take directed courses in which they earn an average grade of at least a *B*. No credit toward a degree will be granted for these courses.

### MASTER OF SCIENCE IN COMPUTER SCIENCE

Required mathematics background courses (unless the student has credit in equivalent courses). No graduate credit given, but a GPA of at least 3.0 is to be maintained.

Prefix	Number	Short Title	Course Credit Hrs	Program Required
MATHS	161	Appl Calc 1 (3)		
MATHS	162	Appl Calc 2 (3)		
MATHS	217	Lin Algebra (4)		
MATHS	221	Pbty Stats (3)		

Required computer science background courses (unless the student has credit in equivalent courses). No credit given toward the degree, but a grade of at least a *B* is to be earned in each course.

Prefix	Number	Short Title	Course Credit Hrs	Program Required
CS	120	Comp Sci 1	4	
CS	121	Comp Sci 2	4	
CS	124	Discr Struct	3	
CS	230	Org Arch 1	3	
CS	232	Data Struct	3	
CS	324	Dsg Ana Algo	3	
CS	330	Org Arch 2	3	
CS	335	Prog Lang	3	
<i>Thesis option</i> Required courses				
CS	570	Thy Cmptn 1	3	
CS	670	Thy Cmptn 2	3	
CS	689	Res Methods	3	
CS	693	Resrch Collq	1	
CS	697	Software Eng	3	
THES	698	Thesis (1–6)	6	
15 hours of electives (including at least one 600-level course, other than CS 699)				
CS	527	Networks (3)		
CS	530	System Prog (3)		
CS	534	Networked Db (3)		
CS	536	Database Dg (3)		
CS	537	Net Prog (3)		
CS	538	Graphics (3)		
CS	539	Curr Tpcs CS (3–6)		
CS	545	G U I (3)		
CS	555	Data Mining (3)		

CS	556	Image Proc (3)		
CS	557	Appl Cryptog (3)		
CS	576	Op Systems (3)		
CS	636	Adv Db Sys (3)		
CS	638	Topics Graph (3)		
CS	639	Seminar (3)		
CS	642	Simulations (3)		
CS	665	Ap Comp Geom (3)		
CS	668	Graph Algo (3)		
CS	675	Model Check (3)		
CS	678	Compil Const (3)		
CS	699	Read Honor (3)		
MATHS	562	Numer Anls 1 (3)		
MATHS	563	Numer Anls 2 (3)		15
				34 hrs
<i>Nonthesis option</i> Required courses				
CS	570	Thy Cmptn 1	3	
CS	670	Thy Cmptn 2	3	
CS	689	Res Methods	3	
CS	693	Resrch Collq	1	
CS	697	Software Eng	3	
21 hours of electives (including at least two 600-level courses, other than CS 699)				
CS	527	Networks (3)		
CS	530	System Prog (3)		
CS	534	Networked Db (3)		
CS	536	Database Dg n(3)		
CS	537	Net Prog (3)		
CS	538	Graphics (3)		
CS	539	Curr Tpcs CS (3–6)		
CS	545	G U I (3)		
CS	555	Data Mining (3)		
CS	556	Image Proc (3)		
CS	557	Appl Cryptog (3)		
CS	576	Op Systems (3)		
CS	636	Adv Db Sys (3)		
CS	638	Topics Graph (3)		
CS	639	Seminar (3)		
CS	642	Simulations (3)		
CS	665	Ap Comp Geom (3)		
CS	668	Graph Algo (3)		
CS	675	Model Check (3)		
CS	678	Compil Const (3)		
CS	699	Read Honor (3)		
MATHS	562	Numer Anls 1 (3)		
MATHS	563	Numer Anls 2 (3)		21
				34 hrs

**MINOR IN COMPUTER SCIENCE**

Prefix	Number	Short Title	Course Credit Hrs	Program Required
<i>12 hours from</i>				
CS	527	Networks (3)		
CS	530	System Prog (3)		
CS	534	Networked Db (3)		
CS	536	Database Dgn (3)		
CS	537	Net Prog (3)		
CS	538	Graphics (3)		
CS	545	G U I (3)		
CS	555	Data Mining (3)		
CS	556	Image Proc (3)		
CS	557	Appl Cryptog (3)		
CS	570	Thy Cmptn 1 (3)		
CS	576	Op Systems (3)		
CS	636	Adv Db Sys (3)		
CS	638	Topics Graph (3)		
CS	639	Seminar (3)		
CS	642	Simulations ( 3)		
CS	665	Ap Comp Geom (3)		
CS	668	Graph Algo (3)		
CS	670	Thy Cmptn 2 (3)		
CS	675	Model Check (3)		
CS	678	Compil Const (3)		
CS	689	Res Methods (3)		
CS	697	Software Eng (3)		
CS	699	Read Honor (3)		
MATHS	562	Numer Anls 1 (3)		
MATHS	563	Numer Anls 2 (3)		
				12 hrs

**DOCTOR OF EDUCATION (EdD and PhD) WITH MAJOR IN COMPUTER SCIENCE**

EdD program in science education and PhD program in philosophy in science with computer science as the major area is available. See the Science listing on page 159 under the College of Sciences and Humanities for details.

**COGNATE IN THEORY OF COMPUTING**

This cognate is aimed at the EdD in science candidate who already has the background course work in computer science that is required of all candidates entering the master of science degree program in computer science, as well as the relevant mathematical background prerequisites to the program.

**Degree Requirements**

Prefix	Number	Short Title	Course Credit Hrs	Program Required
CS	570	Thy Cmptn 1	3	
CS	668	Graph Algo	3	
CS	670	Thy Cmptn 2	3	
				9
Electives (choose two courses for the 15-credit-hour cognate, or five courses for the 24-hour cognate.)				
CS	538	Graphics	3	
CS	555	Data Mining	3	
CS	557	Appl Cryptog	3	
CS	638	Topics Graph	3	
CS	639	Seminar	3	
CS	642	Simulations	3	
CS	665	Ap Comp Geom	3	
CS	675	Model Check	3	
CS	678	Compil Const	3	
CS	699	Read Honor	3	
MATHS	562	Numer Anls 1	3	
MATHS	563	Numer Anls 2	3	
				6 or 15 hrs

Up to 9 hours of 500-level courses permitted on the 15-hour cognate; up to 12 hours of 500-level courses permitted on the 24-hour cognate.

A total of 9 hours of CS 699 may be earned for the 24-hour cognate and a total of 6 hours of CS 699 may be earned for the 15-hour cognate.

## COMPUTER SCIENCE (CS)

**500 Fundamentals of Computing. (3)** Develop programming skills in a structured language with emphasis on top-down design and modular structure. Experience with various commercial software packages.

*Not open to computer science majors.*

**514 Introduction to Programming 1. (3)** Problems of programming in a structured language emphasizing top-down design and modular structure. Designed primarily for experienced classroom teachers in public schools.

*Not open to students who have credit in CS 110, 120, or the equivalent or to computer science majors.*

**516 Introduction to Programming 2. (3)** An introduction to files and their applications. An introduction to a LOGO environment.

*Prerequisite:* CS 514 or permission of the department chairperson.

*Not open to computer science majors.*

**517 Introduction to Programming. (3)** Software development using a high-level programming language (such as C++ or Java) for a wide range of information system applications. Structured programming, data types, functions, arrays, pointers, and recursion. Applications from areas of interest.

*Not open to graduate majors in computer science.*

**527 Distributed Processing and Networks. (3)** The hardware and software of computer networks and distributed processing. Develops the important design parameters and a general design methodology.

*Prerequisite:* CS 330.

**530 System Programming. (3)** Considers the computer system from the points of view of its architecture, operating system, and applications. Topics include processor organization, peripheral devices, I/O programming, system programs, monitor services, file organization, and real-time applications.

*Prerequisite:* CS 330.

*Not open to students who have credit in CS 430.*

**534 Networked Databases. (3)** Principles, methodologies, techniques, languages, and tools for database-driven Web application development. Topics include database concepts, server-side programming, client-side programming, and dynamic Web application design. Programming projects reinforcing concepts are required.

*Prerequisite:* CS 232.

*Not open to students who have credit in CS 334.*

**536 Database Design. (3)** Fundamental concepts of designing, using, and implementing database systems and applications. Topics include: database modeling and design, the languages and facilities provided by the database management systems. Class programming includes: Oracle PL/SQL, loader, JDBC, embedded SQL in Java, Oracle Web development, JavaServer Pages, and Java Servlets.

*Prerequisite:* CS 334 or permission of the instructor.

*Not open to students who have credit in CS 436.*

**537 Network Programming. (3)** Client server model and software design, program interface to protocols, algorithms and issues in client and server software design. Remote procedure call concepts, distributed program generation.

*Prerequisite:* CS 530 or the equivalent.

**538 Graphics. (3)** Methods of developing, modifying, and rendering graphics displays. Emphasizes the design and writing of graphics software for both two- and three-dimensional displays. Knowledge of a structured high-level language is required.

*Prerequisite:* CS 232; MATHS 217.

*Not open to students who have credit in CS 438.*

**539 Current Topics in Computer Science. (3–6)** In-depth study of a topic taught in a seminar format. Topics will be posted in the department before registration.

*Prerequisite:* CS 324, 330, 335 or permission of the instructor.

A total of 9 hours of credit may be earned, but no more than 6 in any one semester or term.

A total of 9 hours of combined credit may be earned in CS 539, 639.

**545 Graphical User Interfaces. (3)** Introduction to the principles of design and implementation of user interfaces emphasizing graphical user interfaces. Topics include design goals, user interface standards, event-driven programming, application of object-oriented design, and programming to GUIs, menus, and dialog boxes.

*Prerequisite:* CS 232 or permission of the instructor.  
*Not open to* students who have credit in CS 345.

**547 Computer, Information, and Network Security. (3)** Topics include encryption, decryption, protocols, viruses, network security, authentication, legal and ethical issues, and security in operating systems, databases, e-commerce, Internet, wireless. Algorithms, protocols, applications such as RSA, DES, SSL, Firewalls, Digital Signatures, and VPNs, and emerging topics will be explored.

*Prerequisite:* CS 232.

**555 Introduction to Data Mining. (3)** Topics include data preprocessing, clustering analysis, data classification, mining association rules, data mining and database, complex data mining, Web mining, new application in data mining such as intrusion detection and bio-informatics.

*Prerequisite:* CS 232 or permission of the instructor.  
*Not open to* students who have credit in CS 455.

**556 Image Processing. (3)** Project based, dealing with basic principles of digital image processing and computer vision. Topics: digital image formats, geometric operations on digital images, filtering, histogramming, binarization of grayscale images, labeling binary images, perimeter and area determination, thinning operations, object recognition using global features, edge detection processes, and other topics as time permits.

*Prerequisite:* CS 232 or permission of the instructor.  
*Not open to* students who have credit in CS 456.

**557 Applied Cryptography. (3)** Introduction of basic principles and application of cryptography. Topics include encryption, decryption, private and public key systems, and their mathematical foundation: divisibility and Euclidean algorithms, arithmetic of congruences, and large prime numbers. Projects are implementations of related algorithms. LISP and JAVA are recommended languages.

*Prerequisite:* CS 232.  
*Not open to* students who have credit in CS 457.

**570 Theory of Computation 1. (3)** Mathematical logic; alphabets and languages; finite automata, regular and nonregular languages, and Kleene's theorem; regular grammars; pushdown automata and context-free grammars; Turing and Post machines; recursive and recursively enumerable languages; the Chomsky Hierarchy.

*Prerequisite:* CS 324 or permission of the instructor.  
*Not open to* students who have credit in CS 470.

**576 Operating Systems. (3)** The functions and structure of computer operating systems. Processor, memory, and device management. Concurrency and process synchronization. Input/output handling, device drivers, and disk scheduling. File systems. Operating system design philosophy.

*Prerequisite:* CS 330.  
*Not open to* students who have credit in CS 476.

**636 Advanced Database Systems. (3)** Topics include knowledge representation and ontology concepts, object database concepts, database security and authorization, distributed databases, client-server architectures, Internet databases, and emerging database technologies and applications. Programming of both database techniques and application servers is based on current technologies such as ORACLE.

*Prerequisite:* CS 334 or 534 or 436 or 536 or permission of the instructor.

**638 Advanced Topics in Computer Graphics. (3)** Topics will be chosen from current research areas in computer graphics and from advanced topics in classical computer graphics. Possible topics include fractals, ray tracing, animation techniques, and geometric modeling.

*Prerequisite:* CS 438 or 538.

**639 Seminar in Computer Science. (3)** Readings and conferences assigned in some particular problem or group of problems in computer science.

*Prerequisite:* CS 324, 330, 335.

A total of 9 hours of combined credit may be earned in CS 539, 639.

**642 Simulation Techniques. (3)** An introduction to the principles and applications of simulation. Use of higher-level languages and simulation languages as applied to system studies. Use of examples from different subjects to carry out simulation.

*Prerequisite:* CS 232; MATHS 221.

**665 Applied Computational Geometry. (3)** Topics such as algorithms for polygon triangulation, polygon partitioning and their applications, convex hulls in two and three dimensions and their applications, Voronoi diagrams and their applications, search and intersection algorithms, robot motion planning, and implementation of algorithms.

*Prerequisite:* CS 324 or permission of the instructor.

**668 Graphs, Algorithms, and Applications. (3)** Concepts of graph theory. Algorithms for graph traversal, shortest paths, connectivity, spanning trees, and matchings. Applications of graphs to computer programming, software engineering, VLSI design, networks and flows, and parallel programming.

*Prerequisite:* CS 324 or permission of the instructor.

**670 Theory of Computation 2. (3)** Computability and decidability; introduction to the theory of computational complexity; the classes  $\mathcal{P}$  and  $\mathcal{NP}$ ;  $\mathcal{NP}$ -completeness; examples of some  $\mathcal{NP}$ -complete problems; nondeterminism and parallel computation; proving the correctness of programs.

*Prerequisite:* CS 570.

**675 Model Checking. (3)** Overview of formal verification techniques in software engineering; system modeling with automata; temporal logics; algorithms and techniques of model checking; study and use of model checkers such as SPIN; applications of model checking to critical systems in industry.

*Prerequisite:* CS 570.

**678 Compiler Construction. (3)** Review of context-free grammars and basic parsing concept, compiler organization, and construction of components for a compiler.

*Prerequisite:* CS 232.

**689 Research Methods in Computer Science. (3)** Discussions on research areas in computer science, scientific methods of research, and dissemination of research. Requirements include presentations and written reports that demonstrate proficiency in presentation tools and techniques, statistical and experimental design techniques, and library and literature searches.

*Prerequisite:* CS 570.

**693 Research Colloquium. (1)** Invited presentations on topics of current interest in computer science. Students must attend a minimum of 75 percent of the presentations in each of two semesters in order to earn credit.

**697 Software Engineering. (3)** Software engineering principles and concepts. The software life cycle, structured specifications, design tools and techniques, software reliability, and verifying program correctness.

*Prerequisite:* CS 232 and three graduate courses in computer science.

*Not open to* students who have credit in CS 497.

**699 Reading and Honors. (3)** Special advanced work not offered in other courses. Requirements include a final written report and a presentation in the departmental colloquium series.

*Prerequisite:* CS 324, 330, 335; permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

A total of 12 hours of combined CS 539, 639, and 699 credit may be earned.

## CRIMINAL JUSTICE AND CRIMINOLOGY

[www.bsu.edu/cjc](http://www.bsu.edu/cjc)

North Quadrangle 248, 765-285-5979

*Chairperson:* James E. Hendricks

*Graduate Faculty:* Brown, Byers, Hendricks, Ho, McKean, Nickoli

### CRIMINAL JUSTICE AND CRIMINOLOGY (CJC)

**650 Criminal Justice Administration. (3)** An examination of the study of the principles of administration of criminal justice agencies and the development of present and future criminal justice leaders.

**651 Interpersonal Relations in Criminal Justice. (3)** Exploration of interpersonal relationships in an agency context. Examines issues peculiar to criminal justice agencies, including cynicism, trauma, burnout, everyday stressors, authoritarian management structures and leadership styles, peer loyalty versus organizational loyalty versus public duty, and public relations.

**652 Philosophical Aspects of Criminal Justice Practice. (3)** Provides philosophical and moral bases for the establishment and operation of justice system agencies charged with enforcement of criminal codes and preservation of social order, including an overview of fundamental philosophical issues of justice-system practices.

**690 Independent Study in Criminal Justice. (1–3)** An opportunity to study specific topics related to the criminal justice system.

*Prerequisite:* permission of the instructor.

A total of 3 hours of credit may be earned.

## ENGLISH

[www.bsu.edu/english](http://www.bsu.edu/english)

Robert P. Bell Building 297, 765-285-8580

*Chairperson:* Elizabeth Riddle

*Director of Graduate Studies:* Deborah Mix

*Graduate Faculty:* Beach, Bogue, Christman, Collier, Felsentein, Habich, Hamada, Hanson, Hartman, Huff, Lovelace, MacKay, McBride, McKinney, Metzger, Mix, Neely, Newbold, Nowatzki, Onkey, Papper, Peterson, Priebe, Ranieri, Rice, Riddle, Seig, Stahlke, Stallings, Stedman, G. Strecker, Trechsel, Trimmer

## PROGRAMS

Master of Arts (MA) in English (general, rhetoric and composition, creative writing, and literature), in linguistics, and in teaching English to speakers of other languages (TESOL); Doctor of Philosophy (PhD) in English (with concentration areas in literature, in rhetoric and composition, and in applied linguistics).

Cognates are available in composition, literary theory, literature, linguistics, TESOL, and English language arts.

### MASTER OF ARTS IN ENGLISH (GENERAL)

#### Admission

Applicants must meet the admission requirements of the Graduate School, have an undergraduate grade point average (GPA) of at least 3.0, and submit Graduate Record Examination (GRE) scores (required for native speakers of English) or Test of English as a Foreign Language (TOEFL) scores (required for nonnative speakers of English), a statement of purpose (750-1000 words), examples of their scholarly or critical writing, and three letters of recommendation.

#### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Core Requirements				
Approved courses in English				15-29
Research requirement				
ENG	601	Res Eng Stu (3)		
<i>or</i>				
RES	697	Research Ppr (1-3)		
<i>or</i>				
THES	698	Thesis (1-6)		3-6
Minors and electives				0-14
				32 hrs

### MASTER OF ARTS IN ENGLISH (RHETORIC AND COMPOSITION)

#### Admission

Applicants must meet the admission requirements of the Graduate School, have an undergraduate grade point average (GPA) of at least 3.0, submit Graduate Record Examination (GRE) scores (required for native speakers of English) or Test of English as a Foreign Language (TOEFL) scores (required for nonnative speakers of English), a statement of purpose (750 to 1000 words), examples of their scholarly or critical writing, and three letters of recommendation.

#### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Core requirements				
ENG	601	Res Eng Stu	3	
ENG	604	Tch Tech	3	
ENG	620	Ling St Eng	3	
ENG	690	Seminar Comp	3	
ENG	609	In Writ Proj (3)		
<i>or</i>				
ENG	693	Writ in Prof (3)	3	
ENG	694	Cls Rhetoric	3	
ENG	699	Contemp Comp	3	
RES	697	Research Ppr (1-3)		
<i>or</i>				
THES	698	Thesis (1-6)		3-6
Electives				5-11
				32 hrs
ENG 601 may be waived for students who choose the nonthesis option.				

## MASTER OF ARTS IN ENGLISH (CREATIVE WRITING)

### Admission

Applicants must meet the admission requirements of the Graduate School, have an undergraduate grade point average (GPA) of at least 3.0, and submit Graduate Record Examination (GRE) scores (required for native speakers of English) or Test of English as a Foreign Language (TOEFL) scores (required for nonnative speakers of English), a statement of purpose (750-1000 words), portfolio of 20 pages of creative writing, and three letters of recommendation.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Core requirements				
ENG	610	Rdg Wrtg Grs	3	
ENG	614	Pr Lit Edit (3)		
<i>or</i>				
ENG	605	Tch Eng Stu (3)	3	
Complete 3-9 hours from				
ENG	611	Wkp Cr Nonfi (3-9)		
<i>and/or</i>				
ENG	612	Fict Wtg Wkp (3-9)		
<i>and/or</i>				
ENG	613	Poetry Wr Wk (3-9)	3-9	
Courses in literature				6
THES	698	Thesis (1-6)	6	
Electives				6
				33 hrs

## MASTER OF ARTS IN ENGLISH (LITERATURE)

### Admission

Applicants must meet the admission requirements of the Graduate School, have an undergraduate grade point average (GPA) of at least 3.0, and submit Graduate Record Examination (GRE) scores (required for native speakers of English) or Test of English as a Foreign Language (TOEFL) scores (required for nonnative speakers of English), submit scores on the GRE specialized test "Literature in English," a statement of purpose (750-1000 words), examples of their scholarly or critical writing, and three letters of recommendation.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Core requirements				
ENG	601	Res Eng Stu	3	
ENG	606	Lit Theory 1	3	
<i>or</i>				
ENG	607	Lit Theory 2 (3)	3	
17–20 hours of approved graduate courses in literature including American literature				6
British and World literature				
Before 1660			3	
After 1660			3	
Approved literature electives				5-8
Research requirement				
RES	697	Research Ppr (1–3)		
<i>or</i>				
THES	698	Thesis (1–6)		3-6
Electives				0-3
				32 hrs

## MASTER OF ARTS IN LINGUISTICS

### Admission

Applicants must meet the admission requirements of the Graduate School, have an undergraduate grade point average (GPA) of at least 3.0, have the equivalent of at least two years of college-level study of foreign language (requirement can be met during MA program), and submit a statement of purpose (750 to 1000 words), Graduate Record Examination (GRE) scores (required for native speakers of English) or Test of English as a Foreign Language (TOEFL) scores (required for nonnative speakers of English), examples of their scholarly writing, and three letters of recommendation.

## Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
ENG 520 or the equivalent will be required but will not count towards required hours in the degree.				
Major requirements				
ENG	621	Mean Str Eng	3	
ENG	623	Phon & Phonl	3	
ENG	626	Morph & Synt	3	
ENG	627	Socioling	3	
Directed electives (at least 15 hours from the following courses):				
ENG	622	His Eng Lang (3)		
ENG	625	Phonology (3)		
ENG	628	Lang Culture (3)		
ENG	629	Top Ap Ling (3)		
ENG	630	Contras Anls (3)		
ENG	631	Hist Linguis (3)		
ENG	632	Discrs Anls (3)		
ENG	682	Top Eng Ling (3)		
ENG	686	Top In Ling (3)		15
Electives (3 hours, an additional course from the directed electives or any of the following):				
ENG	624	Found S L A (3)		
ENG	684	Topics S L A (3)		
ENG	693	Writ In Prof (3)		3
Research requirement				
ENG	601	Res Eng Stu	3	
<i>and</i>				
RES	697	Research Ppr (1-3)		
<i>or</i>				
CRPRJ	698	Creat Proj (3 or 6)	3	
				36 hrs

Depending on the nature of the student's research, the student may also be advised to take one or more courses in Experimental Design and Statistics in addition to other course work.

## MASTER OF ARTS IN TEACHING ENGLISH TO SPEAKERS OF OTHER LANGUAGES (TESOL)

### Admission

Applicants must meet the admission requirements of the Graduate School, have an undergraduate grade point average (GPA) of at least 3.0, have the equivalent of at least two years of college-level study of foreign language (requirement can be met during MA program), and submit a statement of purpose (750 to 1000 words), Graduate Record Examination (GRE) scores (required for native speakers of English) or Test of English as a Foreign Language (TOEFL) scores (required for nonnative speakers of English), examples of their scholarly writing, and three letters of recommendation.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
ENG 520 or the equivalent will be required but will not count towards required hours in the degree.				
Major requirements				
ENG	616	Th Lan Learn	3	
ENG	617	Meth Tch ELL	3	
ENG	618	Mat Tch ELL	3	
ENG	624	Found S L A	3	
Directed electives 18 hours from				
ENG	605	Tch Eng Stu (3)		
ENG	621	Mean Str Eng (3)		
ENG	622	His Eng Lang (3)		
ENG	623	Phon & Phonl (3)		
ENG	625	Phonology (3)		
ENG	626	Morph & Synt (3)		
ENG	627	Socioling (3)		
ENG	628	Lang Culture (3)		
ENG	629	Top Ap Ling (3)		
ENG	630	Contras Anls (3)		
ENG	631	Hist Linguis (3)		
ENG	632	Discrs Anls (3)		
ENG	682	Top Eng Ling (3)		
ENG	684	Topics S L A (3)		
ENG	686	Top In Ling (3)		
ENG	693	Writ In Prof (3)		18
Research requirements				
ENG	601	Res Eng Stu	3	
<i>and</i>				
RES	697	Research Ppr (1-3)		
<i>or</i>				
CRPRJ	698	Creat Proj (3 or 6)	3	
				36 hrs

Depending on the nature of the student's research, the student may also be advised to take one or more courses in Experimental Design and Statistics in addition to other course work.

## **MASTER OF ARTS IN TEACHING ENGLISH TO SPEAKERS OF OTHER LANGUAGES (TESOL) AND LINGUISTICS**

### **Admission**

Applicants must meet the admission requirements of the Graduate School, have an undergraduate grade point average (GPA) of at least 3.0, have the equivalent of at least two years of college-level study of foreign language (requirement can be met during MA program), and submit a statement of purpose (750 to 1000 words), Graduate Record Examination (GRE) scores (required for native speakers of English) or Test of English as a Foreign Language (TOEFL) scores

(required for nonnative speakers of English), examples of their scholarly writing, and three letters of recommendation.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
ENG 520 or the equivalent will be required but will not count towards required hours in the degree.				
Major requirements				
ENG	616	Th Lan Learn	3	
ENG	617	Meth Tch ELL	3	
ENG	618	Mat Tch ELL	3	
ENG	621	Mean Str Eng	3	
ENG	623	Phon & Phonl	3	
ENG	624	Found S L A	3	
ENG	626	Morph & Synt	3	
ENG	627	Socioling	3	
Directed electives (at least 15 hours from the following courses):				
ENG	605	Tch Eng Stu (3)		
ENG	622	His Eng Lang (3)		
ENG	625	Phonology (3)		
ENG	628	Lang Culture (3)		
ENG	629	Top Ap Ling (3)		
ENG	630	Contras Anls (3)		
ENG	631	Hist Linguis (3)		
ENG	632	Discrs Anls (3)		
ENG	682	Top Eng Ling (3)		
ENG	684	Topics S L A (3)		
ENG	686	Top In Ling (3)		
ENG	693	Writ In Prof (3)		15
Research requirements				
ENG	601	Res Eng Stu	3	
<i>and</i>				
RES	697	Research Ppr (1-3)		
<i>or</i>				
CRPRJ		Creat Proj (3 or 6)	3	
				45 hrs

Depending on the nature of the student's research, the student may also be advised to take one or more courses in Experimental Design and Statistics in addition to other course work.

### DOCTOR OF PHILOSOPHY (PhD) IN ENGLISH

Concentration in Applied Linguistics

#### Admission

Applicants to the PhD in English with a concentration in applied linguistics must hold an earned master's or equivalent degree and meet the admission requirements of the Graduate School, submit a statement of purpose (750 to 1000 words), graduate grade point average (GPA) of at least 3.3 (preferably 3.5), cumulative GRE general scores (required for native speakers of English) or (for nonnative speakers of English) cumulative TOEFL scores of at least 575 (or equivalent), and submit examples of their scholarly or critical writing and three letters of recommendation. Before writing comprehensive examinations, candidates must demonstrate competence in two foreign languages, other than English, relevant to their research.

### Degree Requirements

The PhD in English with a concentration in applied linguistics requires a total of 48 graduate hours and a dissertation (with 10 associated hours to be taken at Ball State). Up to 32 hours from the masters degree may be applied to the total of 90 hours for the doctoral degree. Students may elect to take one or more cognates in an appropriate department or university area. ENG 520 Introduction to Linguistics and a graduate research course are prerequisites to the program. Students who have not taken them or done equivalent work must take ENG 520 or an additional 3 hours of ENG 601, but these courses will not be included in the 48 hours of course work required for graduation.

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Transfer credit (up to)				32
Required core courses				
Students must complete the following four courses as early as possible in the program.				
ENG	621	Mean Str Eng	3	
ENG	623	Phon & Phonl	3	
ENG	626	Morph & Synt	3	
ENG	627	Socioling	3	

At the end of the first year of doctoral study, doctoral students will undergo a review to determine their fitness to continue in the program. This review will examine their academic and professional performance to this point in the doctoral program. Details regarding this review will be outlined during the fall semester each year, and the due date for review materials will be set. Students will have at least one month to prepare the materials to be turned in at some point during the spring semester. Students who are not advanced will be permitted to complete a master's degree but will not be permitted to continue in the doctoral program.

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Directed electives				
Students must choose at least 18 hours from the following courses. Students may be advised to take one or more courses in Experimental Design and Statistics in addition to other course work.				
ENG	622	His Eng Lang (3)		
ENG	624	Found S L A (3)		
ENG	625	Phonology (3)		
ENG	628	Lang Culture (3)		

ENG	629	Top Ap Ling (3)		
ENG	630	Contras Anls (3)		
ENG	631	Hist Linguis (3)		
ENG	632	Discrs Anls (3)		
ENG	682	Top Eng Ling (3)		
ENG	684	Topics S L A (3)		
ENG	686	Top in Ling (3)		
ENG	693	Writ in Prof (3)		
ENG	701	Dir Rdgs Res (3)		
ENG	729	Adv Top Ling (3)		18
Electives				15
Research requirement				
ENG	601	Res Eng Stu (3-6)		3
DISS	799	Drs Dissert (1-24)		10
				90 hrs

## Concentration in Rhetoric and Composition

### Admission

Applicants for the PhD in English with a concentration in rhetoric and composition must hold an earned master's or equivalent degree, meet the admission requirements of the Graduate School, and submit a statement of purpose (750 to 1000 words), GRE score of at least 550 (preferred) on verbal aptitude, a graduate GPA of at least 3.3 (preferably 3.5), examples of their scholarly or critical writing, and three letters of recommendation. Nonnative speakers of English may substitute TOEFL scores for the GRE scores.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
ENG	605	Tch Eng Stu	3	
ENG	606	Lit Theory 1	3	
ENG	620	Ling St Eng	3	
ENG	693	Writ in Prof	3	
ENG	699	Contemp Comp	3	
3 (rhetoric and composition) hours in each of the following areas:				
Rhetorical History, Digital Literacies, Research Methodologies				9
9 additional hours directed electives in one of the three areas of emphasis				9
Electives				9
Course work from Master's degree or equivalent				32
DISS	799	Drs Dissert (1-24)		16
				90 hrs

## Concentration in Literature

### Admission

Applicants for the PhD in English with a concentration in literature must hold an earned master's or equivalent degree, meet the admission requirements of the Graduate School, and submit a statement of purpose (750 to 1000 words), Graduate Record Examination (GRE) scores of at least 550 on verbal aptitude (preferred), a graduate GPA of at least 3.3 (preferably 3.5), examples of their scholarly or critical writing, and three letters of recommendation. Nonnative speakers of English may substitute TOEFL scores for the GRE aptitude test. In addition, all applicants for the concentration in literature must submit scores for the GRE subject test in literature of at least 550 (preferred).

Prefix	Number	Short Title	Course Credit Hrs	Program Required
ENG	601	Res Eng Stu	3	
*ENG	605	Tch Eng Stu (3)		6
ENG	606	Lit Theory 1 (3)		
<i>or</i>				
ENG	607	Lit Theory 2 (3)	3	
	693	Writ in Prof	3	
3 hours in each of the following areas: (must include at least 3 hours of American Literature)				
British Literature to 1500				
British/American literature 1500–1700				
British/American literature 1700–1800				
British/American literature 1800–1900				
Literature 1900–present				15
One course in one of the following areas:				
American ethnic studies				
Gender studies				
International studies				3
Directed electives				
At least 15 hours of electives in courses chosen in consultation with advisor				15
Electives				24
DISS	799	Drs Dissert (1–24)		18
				90 hrs

\*ENG 605 is to be taken once as “Composition” and a second time as “Literature.”

### DOCTORAL COGNATE IN LITERARY THEORY

See the department for information regarding course selection.

For purposes of advising, enrollment in all graduate courses in the Department of English requires permission of the department.

### ENGLISH (ENG)

**520 Introduction to Linguistics. (3)** Basic concepts, scope, and methodology of the science of language.

*Prerequisite:* permission of the department chairperson.

*Not open to* students who have credit in ENG 320.

**588 English Studies Abroad. (3–6)** English studies at approved study abroad sites. Credit applied to department requirements as approved by the department chairperson.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.

**601 Research in English Studies. (3)** Research methods in composition, English education, language and linguistics, and/or literature.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**602 English Internship. (1–6)** Supervised on-the-job training and work experience in which English majors and minors apply what they have learned. Involves assigned duties in an organization, agency, corporation, bank, or professional office, with appropriate monetary compensation for services rendered.

*Prerequisite:* undergraduate English major or minor; permission of the internship program director.

A total of 6 hours of credit may be earned. A maximum of 3 hours may apply as elective credit toward the MA or PhD in English.

**603 Independent Study. (1–3)** Independent study and research in composition, creative writing, English education, language and linguistics, or literature.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**604 Teaching with Technology. (3)** Theory and practice of using major technologies in the teaching of English; primary emphasis on postsecondary level. Focuses on practical activities related to planning and carrying out text-intensive teaching with technology.

*Prerequisite:* permission of the department chairperson.

**605 Teaching in English Studies. (3)** Instruction and, where appropriate, close supervision in pedagogical theory and practice and other proficiencies and skills required for success in university teaching.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**606 Literary Theory 1. (3)** Critical theory through New Criticism and its application to selections from the various forms of literature.

*Prerequisite:* permission of the department chairperson.

**607 Literary Theory 2. (3)** Contemporary critical theory and its application to selections from the various forms of literature.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**608 Seminar in Theory. (3)** Topics in theory. Advanced study of the work of specified theorists or in specified theoretical paradigms.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**609 Indiana Writing Project. (1–6)** Training in writing, research, and teaching according to the National Writing Project model. Taught by the Indiana Writing Project (IWP) director or codirector assisted by

teacher consultants. Applies to a degree only with the department chairperson's permission. The course is not intended to substitute for certification or degree requirements.

*Prerequisite:* permission after application to the IWP director.

A total of 9 hours of credit may be earned, but no more than 6 in any one semester or term.

**610 Reading and Writing Across the Genres. (3)** A comprehensive introduction to graduate creative writing, with study and practice of the forms and techniques of fiction, poetry, and creative nonfiction.

*Prerequisite:* permission of the department chairperson.

**611 Workshop in Creative Non-Fiction. (3)** Instruction, practice, and criticism in a workshop format.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**612 Workshop in Fiction Writing. (3)** Instruction, practice, and criticism in a workshop format.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**613 Workshop in Poetry Writing. (3)** Instruction, practice, and criticism in a workshop format.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**614 Practicum in Literary Editing. (3)** History and philosophy of literary publishing, with practical experience in editorial work and production in print and electronic formats.

*Prerequisite:* permission of the department chairperson.

**616 (536) Introduction to Theories of Language Learning. (3)** Psychological, sociocultural, and linguistic basis of language learning; research and theoretical perspectives related to second language teaching.

*Prerequisite:* knowledge of a foreign language; permission of the department chairperson.

*Prerequisite or parallel:* ENG 520 or equivalent.

**617 (537) Methods for Teaching English Language Learners. (3)** Study and practice of a variety of methods in teaching English language learners in second or foreign language settings.

*Prerequisite:* permission of the department chairperson.

*Prerequisite or parallel:* ENG 520 or equivalent.

**618 Materials Development for Teaching English Language Learners. (3)** Focus on the use and design of materials to meet the specific needs of language learners at various levels of proficiency in second and foreign language settings.

*Prerequisite:* permission of the department chairperson.

*Prerequisite or parallel:* ENG 520 or equivalent.

**620 Linguistics and the Study of English. (3)** An introduction for nonspecialists to areas of linguistics pertinent to the study and teaching of English literature and composition.

*Prerequisite:* permission of the department chairperson.

**621 Meaning and Structure in English. (3)** An integrated study of the syntax, semantics, and pragmatics of the English language. Introduces key concepts in syntactic, semantic, and pragmatic analysis, and focuses on aspects of English lexical and grammatical structure most problematic in the teaching of English as a second/foreign language.

*Prerequisite:* ENG 520; permission of the department chairperson.

**622 History of the English Language. (3)** History of the development of the phonological, morphological, lexical, and syntactical systems of the English language from its beginnings to the present day.

*Prerequisite:* permission of the department chairperson.

**623 Phonetics and Phonology. (3)** Speech sounds and the linguistic methods employed in their description, classification, and analysis as elements in language systems. Relationships among speech sounds in a language.

*Prerequisite:* permission of the department chairperson.

**624 Foundations of Second Language Acquisition. (3)** Covers the foundations of second language acquisition theories and research, and introduces various issues related to second language learning and teaching.

*Prerequisite:* ENG 616, 617; permission of the department chairperson.

**625 Phonology. (3)** General characteristics of speech sounds and of the systematic relationships they exhibit in natural languages. Emphasizes current research in generative phonology.

*Prerequisite:* ENG 623; permission of the department chairperson.

**626 Morphology and Syntax. (3)** A detailed examination of the patterns of word and phrase building in natural languages. Emphasizes both formal and functional approaches.

*Prerequisite:* ENG 520; permission of the department chairperson.

**627 Sociolinguistics. (3)** Examines the correlation of linguistic variation with geographic areas and social variables such as sex, age, socioeconomic status, and ethnicity.

*Prerequisite:* ENG 320 or 520; permission of the department chairperson.

**628 Language and Culture. (3)** Examines the ways members of different cultures organize and exploit their linguistic resources. Topics include registers and forms of address, verbal art, conversational strategies, code-switching, language maintenance and death, and cross-cultural miscommunication.

*Prerequisite:* permission of the department chairperson.

**629 Topics in Applied Linguistics. (3)** Intensive study of a selected topic or closely related set of topics relevant to applied linguistics. May be repeated if the topic changes.

*Prerequisite:* ENG 520 or equivalent; 9 additional hours in applied linguistics or permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**630 Contrastive Analysis. (3)** Study of language universals and comparison of the structural systems of natural languages.

*Prerequisite:* ENG 520, 621; knowledge of a foreign language; permission of the department chairperson.

**631 Historical Linguistics. (3)** Scientific study of the process of linguistic change. A survey of the methods and principles used in historical and comparative linguistic analysis.

*Prerequisite:* ENG 623, 625; permission of the department chairperson.

**632 Discourse Analysis. (3)** A detailed examination of the principal methods of analyzing oral and written discourse.

*Prerequisite:* ENG 520 or 621; permission of the department chairperson.

**633 Practicum in Teaching English to Speakers of Other Languages. (1–6)** Practical experience related to the teaching of English as a second or foreign language.

*Prerequisite:* permission of the department chairperson.

*Parallel:* ENG 616 or 617.

A total of 6 hours of credit may be earned.

**640 Studies in American Authors. (3)** Focused study of the works and lives of selected American authors.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**641 Early American Literature. (3)** Examination of selected literary works written through 1830. Attention will also be given to cultural, political, and intellectual contexts and to current scholarship on the period.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**642 Literature of the American Renaissance. (3)** Examination of literary works written from 1830 to 1865. Attention will also be given to cultural, political, and intellectual contexts, and to current scholarship on the period.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**643 American Realism and Naturalism. (3)** Examination of selected literary works from the middle of the nineteenth century into the earliest part of the twentieth century. Considers authors, their work, their philosophies of art, and current scholarship on the period.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**644 Early Twentieth-Century American Literature. (3)** Examination of literary works and intellectual and aesthetic movements during the first half of the twentieth century. Attention will be given to cultural, political, and intellectual contexts and to current scholarship on the period.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**645 Contemporary American Literature. (3)** Examination of literary works from 1945 to the present.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**646 Studies in American Ethnic Literature. (3)** Study of literary works that express the experiences and cultures of American population groups whose voices have not been adequately represented in the literary and social mainstream.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**647 African American Literature. (3)** Examines African American literature focusing on the role of vernacular speech and music; the social status of African Americans and their relations with other racial groups; the connections between race, class, gender, and sexuality; and relevant literary criticism and theory.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**650 Seminar in Literature. (3)** Special topics in literature. Advanced study of a time period, form, nation, and/or specific issue or problem in literary studies.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**651 Studies in the Novel. (3)** Special topics in the novel. Advanced study of a time period, form, nation and/or specific issue or problem.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**652 Studies in Poetry. (3)** Special topics in poetry. Advanced study of a time period, form, nation and/or specific issue or problem.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**653 Studies in Drama. (3)** Special topics in drama. Advanced study of a time period, form, nation and/or specific issue or problem.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**654 Film Studies. (3)** Investigation of theoretical and critical approaches to the cinematic text, which may include studies of language, form, history, reception, narrative, culture, ideological formation, technological innovation, and representation.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**655 Gender Studies. (3)** Exploration of issues in gender theory, which may include studies of power, language, literature, culture, identity, sexuality, representation, and pedagogy, as well as interdisciplinary connections to other political and philosophical theories of race, class, gender, ethnicity, and nationality.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**656 Cultural Studies. (3)** Investigation of cultural studies as it relates to specific texts, social themes, and issues.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**657 Post-Colonial Studies. (3)** Focused study of post-colonial literature and literary theory.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**659 Workshop in Literature. (3-9)** Specific themes or specific units of American, British, or world literature. Stresses both the cooperative efforts of participants and faculty and the critical approaches to literature that are most useful in reading and teaching the literature.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned.

**660 Studies in British Authors. (3)** Focused study of the works and lives of selected British authors.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**661 Early British Studies. (3)** Intensive study of early British literature emphasizing language, sources, structure, and significance of the works. Aspects of early culture pertinent to the works will be considered.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**662 Renaissance and Seventeenth-Century Studies. (3-6)** Study of selected works of English literature of the Tudor, Stuart, and Puritan periods (1485-1660).

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.

**663 Studies in Shakespeare. (3)** Study of major Shakespearean dramas and major Shakespearean criticism. Some attention given to the sonnets.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**664 Studies in English Literature of the Restoration and Eighteenth Century. (3)** An extensive study of the nondramatic works of Dryden, Swift, Pope, and Johnson, with possible supplementary readings from other British authors of the period 1660–1800.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**665 Romantic Studies. (3)** Examination of literary works from the Romantic period. Attention given to the cultural and intellectual contexts of the period as well as current scholarship relevant to the period.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**667 Victorian Studies. (3)** Examination of literature of the Victorian period. Attention given to cultural and intellectual contexts and to the current scholarship relevant to the period.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**668 Early Twentieth-Century British Literature. (3)** Focused study of selected works in early-twentieth-century British literature and culture.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**669 Contemporary British Literature. (3)** Focused study of selected works in contemporary British literature and culture.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**670 Seminar in English Education. (3–9)** Investigations of special topics related to the teaching of English.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned.

**671 Reading Texts in the English Classroom. (3)** Emphasizes current theoretical and research bases for effective reading of texts in the English classroom.

*Prerequisite:* permission of the department chairperson.

**672 Workshop in English Language Arts. (3–9)** A study of the objectives, materials, and teaching techniques employed at the various levels of English language arts instruction with emphasis on application to specific classroom situations. Course content and requirements designed to meet individual needs and interest.

*Prerequisite:* permission of the department chairperson.  
A total of 9 hours of credit may be earned.

**673 English Language and Grammar in the Schools. (3)** An introduction to the scientific study of the English language. The relation of contemporary language description and research to the teaching of English skills in the schools.

*Prerequisite:* permission of the department chairperson.

**674 Teaching English Language Arts in the Elementary Grades. (3)** A critical review of trends and issues and their implications for the teacher in the elementary grades.

*Prerequisite:* permission of the department chairperson.

**675 Teaching Writing in Secondary Schools. (3)** Advanced pedagogy, theory, research, and current issues in teaching writing, language, and visual representation, along with the use of performance assessments in the English Language Arts classroom.

*Prerequisite:* permission of the department chairperson.

**676 Teaching Literature, Speaking and Listening in Secondary Schools. (3)** Advanced pedagogy, theory, research, and current issues in teaching literature, speaking, and listening in the English Language Arts classroom.

*Prerequisite:* permission of the department chairperson.

**677 Literature for Young Children. (2)** Appraisal of literature for young children. Of special interest to students of early-childhood education.

*Prerequisite:* permission of the department chairperson.

**678 Children's Literature. (3)** Overview of the field of children's literature and intensive study of the various genres. Includes study of theoretical issues, research, and recommended practice in teaching children's literature along with the study of a sampling of recently published children's books.

*Prerequisite:* permission of the department chairperson.

**679 Young Adult Literature. (3)** Recent literature suitable for students of varying abilities in junior high/middle and secondary schools. Emphasizes the actual reading of selections with some attention given to methodology.

*Prerequisite:* permission of the department chairperson.  
*Not open to* students who have credit in ENG 414.

**680 History of English Education. (3)** A comprehensive review of the history of English education and the development of English as a school subject in the core curriculum.

*Prerequisite:* permission of the department chairperson.

**681 Reading in English Language Arts Education. (3)** A critical review of significant research in English education and its implications for teaching English in the schools.

*Prerequisite:* permission of the department chairperson.

**682 (721) Topics in English Linguistics. (3)** Intensive study of a selected topic or closely related set of topics relevant to English linguistics.

*Prerequisite:* ENG 520 or equivalent; permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**684 (637) Topics in Second Language Acquisition. (3)** Intensive study of a selected topic or closely related set of topics relevant to Second Language Acquisition.

*Prerequisite:* ENG 520 or equivalent; ENG 616; permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**686 (725) Topics in Linguistics. (3)** Intensive descriptive, theoretical, or applied study of a selected topic or closely related set of topics relevant to linguistics and any of the world's languages.

*Prerequisite:* ENG 520 or equivalent; permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**690 Seminar in Composition. (3)** Special research problems in English composition using recognized techniques of research, extensive readings in selected texts, group discussions, and conferences.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned.

**691 Advanced Composition. (3)** Principles of and practice in the writing and evaluation of expository prose. Intended for teachers of English at the elementary, secondary, and college levels.

*Prerequisite:* permission of the department chairperson.

**692 Writing Technologies. (3)** Examination of relationships among literacy, technology, and English studies. Includes an historical approach to literacy, with major attention to how past and present technologies of literacy affect culture and education. Will explore issues and practices in laboratory sessions.

*Prerequisite:* permission of the department chairperson.

**693 Writing in the Profession. (3)** Directed writing in some of the modes required in the academic profession of English studies, with a view toward producing effective, publishable prose.

*Prerequisite:* permission of the department chairperson.

**694 Classical Rhetoric. (3)** A survey of the history and development of classical rhetoric in English composition. Special research problems in the explication of standard literary texts from a classical rhetorical perspective. Extensive readings in selected texts, some in translations from Latin and Greek.

*Prerequisite:* permission of the department chairperson.

**695 Medieval and Early Modern Rhetoric. (3)** A survey of Western rhetorical theory and practice from the fifth into the seventeenth century. Offers insight into the vocation and impact of rhetoric in the medieval and early modern period, with emphasis on implications for literacy and education.

*Prerequisite:* permission of the department chairperson.

**696 Nineteenth-Century Rhetoric. (3)** Survey of the nineteenth-century theories of composition that established the roots of contemporary teaching practices. Special research problems from a nineteenth-century rhetorical perspective using recognized techniques of research, extensive readings in selected texts, group discussions, and conferences.

*Prerequisite:* permission of the department chairperson.

**697 Contemporary Rhetoric. (3)** Overview of major contemporary rhetorical theories and practice, focusing on several major rhetoricians and recent developments in the field. Special research problems using recognized techniques of research, extensive reading in selected texts, group discussions, and conferences.

*Prerequisite:* permission of the department chairperson.

**698 Rhetoric and Poetics. (3)** Covers identification and theories of poetics in all genres. Includes classical schemes and tropes and contemporary theories about epistemology and figures of speech. Surveys Aristotle's poetics through contemporary criticism.

*Prerequisite:* permission of the department chairperson.

**699 Contemporary Theories of Composition. (3)** Focuses on theories of writing prominent during the past hundred years, contextualizing those theories in terms of history, political movements, theoretical milieu, and educational changes. Connections made to similar shifts in perspective across the academic landscape.

*Prerequisite:* permission of the department chairperson.

**701 Directed Readings and Research. (1–3)** Intensive study of a topic in literature, composition, or linguistics not ordinarily addressed in a regularly scheduled course. Intended to prepare doctoral students on a tutorial basis to research and develop an original dissertation topic.

*Prerequisite:* advanced graduate status in the PhD program in English; permission of the department chairperson.

A total of 3 hours of credit may be earned.

**729 (726) Advanced Topics in Linguistics. (3)** Intensive advanced study of a selected topic or closely related set of topics relevant to linguistics and applied linguistics.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

## GEOGRAPHY

[www.bsu.edu/geog](http://www.bsu.edu/geog)

Cooper Science Complex 425, 765-285-1776

*Chairperson:* Gopalan Venugopal

*Graduate Advisor:* Christopher Airriess

*Graduate Faculty:* Airriess, Coleman, Hawkins, Turcotte, Venugopal, Yang, Zimmerman

### Master of Science (MS) in Geography

This program is designed to provide a solid background in skills such as remote sensing, GIS, and advanced cartography to be applied to various sub-disciplines of geography and allied fields. The demands for skilled work force in these fields continues to expand in industries, business, and government, both locally and nationally. The Internet has paved the way for different types of archived and present data to be available to the public and government in a timely manner. With globalization, employers are looking for people who are skilled in the above fields. An intricate combination of several factors such as growing and changing world economy, changing environment, mobility of multinational corporations, and data availability through various sources have created a major demand for remote sensing and GIS techniques. The specialized courses in remote sensing, GIS, and advanced cartography are designed for students who are interested in handling various types of spatial data.

The Department of Geography is equipped with leading software in remote sensing, GIS and cartography. The department's experienced faculty members can accommodate the needs of students with varied interests.

### Admission

Applicants must meet the admission requirements of the Graduate School.

### Degree Requirements

Requires 30 hours including the research requirement. Undergraduate deficiencies must be fulfilled as needed. Specialized programs apply state-of-the-art technologies such as remote sensing, geographic information systems, and advanced cartography in various subdisciplines of geography, atmospheric science, and allied sciences. The requirements are flexible and allow students to arrange programs of study that will serve as a basis for further graduate study; as preparation for positions in industry, business, and government; or as a way to meet the immediate and changing needs of teachers and educators.

### Course requirements

All students must complete 9 semester hours of core courses, 15 semester hours of directed electives, and 6 semester hours of Thesis (THES 698).

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Core requirements				
GEOG	610	Geog Thought	3	
GEOG	615	Res Methods	3	
GEOG	618	Quant Geog	3	
Directed electives, 15 hours				
GEOG	525	Phys Meteor (3)		
GEOG	530	Wea Analysis (3)		
GEOG	531	Glob Climate (3)		
GEOG	532	Clim Change (3)		
GEOG	534	Atmos Hazard (3)		
GEOG	535	Satrad Meteo (3)		
GEOG	540	Cart Vis 1 (3)		
GEOG	542	Intr Rem Sen (3)		
GEOG	543	Adv Rem Sens (3)		
GEOG	544	Adv GIS Anly (3)		
GEOG	545	GIS App Desg (3)		
GEOG	546	Sem Rem Sen (3)		
GEOG	547	Thermo Meteo (3)		
GEOG	548	GIS Sys Desg (3)		
GEOG	549	Synop Meteor (3)		
GEOG	550	Sev Loc Stor (3)		
GEOG	551	Dynamic Mete (3)		
GEOG	570	World Pol Ge (3)		
GEOG	590	F Obs Sev LS (6)		

GEOG	614	Prob Tch Es (3-6)		
GEOG	620	Seminar Geog (3)		
GEOG	625	Spl Tps GIS (3-6)		
GEOG	630	Spl Tps Cart (3-6)		
GEOG	635	Spl Tps R S (3-6)		
GEOG	640	Spl Tps Atmo (3)		
GEOG	680	D A Field St (1-6)		
GEOG	690	Prof Intern (1-3)		
GEOG	695	Rdgs Sp Stud (1-3)		15
Thesis requirement				
THES	698	Thesis (1-6)		6
				30hrs

### MINOR IN GIScience

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Core requirements, 6 hours				
GEOG	542	Intr Rem Sen	3	
GEOG	544	Adv GIS Anly	3	
<i>9 hours from</i>				
GEOG	543	Adv Rem Sens (3)		
GEOG	545	GIS App Desg (3)		
GEOG	546	Sem Rem Sen (3)		
GEOG	548	GIS Sys Desg (3)		
GEOG	625	Spl Tps GIS (3-6)		
GEOG	635	Spl Tps R S (3-6)		9
				15 hrs

### GEOGRAPHY (GEOG)

**525 Physical Meteorology. (3).** Study of the physical processes of the atmosphere with a focus on solar and terrestrial radiation, clouds, and precipitation.

*Prerequisite:* GEOG 330 or 530; MATHS 165; PHYCS 120 or permission of the instructor.

*Not open to* students who have credit in GEOG 425.

**530 Weather Analysis. (3)** Presentation and practice of synoptic- and meso-scale diagnostic analysis techniques, including a review of satellite and radar remote sensing systems and image interpretation. Introduction to numerical weather prediction.

*Prerequisite:* GEOG 230 or equivalent.

**531 Global Climate. (3)** Introduction to the dynamics of the global climate system. Emphasizes the physical processes that force spatial variability in climate, and the feed-back mechanisms associated with global teleconnections and climate change.

*Prerequisite:* GEOG 330 or 530.

**532 Climate Change and Modification. (3)** Study of the variability of climate over time and space, and factors involved. Focuses on past climates, modeling of future climates, and modification at local or microscale.

*Prerequisite:* GEOG 230 or permission of the instructor.

*Not open to* students who have credit in GEOG 332.

**534 Atmospheric Hazards. (3)** Examination of the causes, consequences, and spatial distribution of hazards deriving from or impacting the atmosphere. Both the physical properties and processes of natural hazards (e.g. hurricanes, tornadoes, biochemical) and the human actions and reactions to these hazards will be emphasized at the local, regional, and global scales.

*Prerequisite:* GEOG 101 or GEOL 101 or permission of the instructor.

*Not open to* students who have credit in GEOG 334.

**535 Satellite and Radar Meteorology. (3)** Study of the platforms and sensors of satellite and radar remote sensing systems used in meteorology and climatology. Emphasis is on satellite and radar products and their interpretation.

*Prerequisite:* GEOG 330 or 530; MATHS 165; PHYCS 120; or permission of the instructor.

*Not open to* students who have credit in GEOG 435.

**540 Cartography and Visualization of Spatial Data. (3)** Introduction to cartographic methods for the visualization and analysis of geographic phenomena. Principles of design are stressed with particular emphasis on methods for symbolizing point, line, and area elements, and the principles and use of color in cartography. Students produce publication quality maps using an industry standard software.

*Not open to* students who have credit in GEOG 340.

**542 Introduction to Remote Sensing. (3)** Principles of remote sensing and its applications on Earth resources. Topics include the physics of remote sensing, aerial photo interpretation, photogrammetry, multispectral, hyperspectral, thermal infrared remote sensing, RADAR/LIDAR, remote sensing of vegetation, water, and soils.

*Not open to* students who have credit in GEOG 342.

**543 Advanced Remote Sensing. (3)** Digital image processing techniques utilized to analyze remotely sensed data. Topics include remote sensing data collection, image pre-processing, image enhancement, image classification, post classification analysis, and multi-temporal data analysis for change detection.

*Prerequisite:* GEOG 542.

*Not open to* students who have credit in GEOG 343.

**544 Advanced Geographic Information Systems Analysis. (3)** Examination and use of analysis techniques in Geographic Information Systems (GIS). Introduction to basic GIS programming. Diagramming GIS logic and processing flows. Exposure to widely used GIS data models.

*Prerequisite:* GEOG 240, 265; or permission of the instructor.

*Not open to* students who have credit in GEOG 344.

**545 Geographic Information Systems Applications Design and Development. (3)** Fundamentals of geographic information system (GIS) programming. Develop and implement customized GIS applications. Exposure to widely used GIS software-programming environments.

*Prerequisite:* GEOG 265, 544; or permission of the instructor.

*Not open to* students who have credit in GEOG 445.

**546 Seminar in Advanced Techniques in Remote Sensing. (3)** Advanced techniques applied to remotely sensed data using state-of-the-art software. Review of current methods of computer and manual interpretation techniques. Includes active participation in classroom presentations.

*Prerequisite:* GEOG 542, 543; or permission of the instructor.

*Not open to* students who have credit in GEOG 443.

**547 Thermodynamic Meteorology. (3)** Application of physical gas laws such as the equation of state and hydrostatic equation to investigate adiabatic processes and parcel theory as they relate to atmospheric instability and connective development.

*Prerequisite:* GEOG 330 or 530; MATHS 165, 166; PHYCS 120, 122 or permission of the instructor.

*Not open to* students who have credit in GEOG 447.

**548 Geographic Information System Design. (3)** Principles of Geographic Information System (GIS) design. Implementation of GIS technology. Database and user-interface design. Practical experience applying advanced GIS tools to analyze spatial data. Workshop format requires student-motivated projects.

*Prerequisite:* GEOG 544.

*Not open to* students who have credit in GEOG 448.

**549 Synoptic Meteorology. (3)** Investigation of synoptic- and mesobeta-scale atmospheric systems, with a focus on analysis and forecasting through the use of satellite, radar, and numerical weather prediction technology.

*Prerequisite:* GEOG 330 or 530; MATHS 165; PHYCS 120 or permission of the instructor.

*Not open to* students who have credit in GEOG 449.

**550 Severe Local Storms. (3)** Survey of severe thunderstorms and tornadoes. Focuses on storm processes and the forecasting of severe local storm events.

*Prerequisite:* GEOG 330 or 530.

**551 Dynamic Meteorology. (3)** Study of the variables that explain four-dimensional atmospheric behavior with primary focus on synoptic-scale processes. Special attention is given to the governing equations and associated approximation and assumption relevant to numerical weather prediction.

*Prerequisite:* GEOG 330 or 530; MATHS 165, 166; PHYCS 120, 122 or permission of the instructor.

*Not open to* students who have credit in GEOG 451.

**570 World Political Geography. (3)** Analysis of the contribution of physical and cultural characteristics of the nations of the world to foreign relations problems.

*Not open to* students who have credit in GEOG 470.

**590 Field Observation of Severe Local Storms. (6)** Field trip to the Great Plains region to observe severe local storms. Begins with two three-hour, oncampus lecture periods, followed by a four-week period of field observation, then concludes with three two-hour, oncampus trip-review lectures.

*Prerequisite:* permission of the instructor.

**610 History of Geographic Thought. (3)** Focuses on the role of geography in the evolution of the physical and social sciences. Traces paradigms from the premodern period of geography through its emergence as an academic discipline to its present-day applications and theory.

**614 Problems in the Teaching of Earth Science. (3–6)** Primarily for experienced teachers: discussion and solution of problems teachers have had in teaching the concepts of earth science, physical geography, and geology. A total of 6 hours of credit may be earned.

**615 Research Methods in Geography. (3)** Examination of research-related topics relevant to first-year graduate study in geography. Focuses on use of the scientific method in solving geographic problems, although topics such as ethics, integrity, professionalism, philosophy, research project designs, and professional presentations are covered.

**618 Quantitative Methods in Geography. (3)** A study of quantitative techniques used in geographic research that focus on the solution of spatial problems. Emphasizes geographic and spatial data, geographic research inferences, point pattern analysis, areal association, and factor analysis in geography.

*Prerequisite:* MATHS 221 or equivalent.

**620 Seminar in Geography. (3)** Small group discussion of geographic problems selected by instructional staff and depending on students' interest.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

*Open only to* majors in geography and related fields.

**625 Special Topics in GIS. (3)** Topics chosen from current research areas in applied GIS and from advanced topics in GIS data representation. Possible topics include advanced spatial models and object modeling with geodatabases.

*Prerequisite:* GEOG 544, 545; or permission of the instructor.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**630 Special Topics in Advanced Cartography. (3)** Advanced study exploring contemporary research in cartographic techniques and production. Topics include trends in cartographic research, academic and commercial sources of cartographic information, and the impact of information technology. Topics vary depending on the needs of the students.

*Prerequisite:* GEOG 340 or 540 or equivalent.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

*Open only to* geography majors.

**635 Special Topics in Remote Sensing. (3)** Research in remote sensing using advanced techniques applied to a field of study such as land use, vegetation, climatology, agriculture, or environmental problems. Research activities are accompanied by presentations on advanced remote-sensing topics.

*Prerequisite:* GEOG 542, 543.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**640 Special Topics in Atmospheric Science. (3)** The study of a topic in atmospheric science within the expertise of the instructor. Examples include such areas as land-surface-atmosphere interactions, meso-scale meteorology, hydroclimatology, climate change, and tropical weather and climate.

*Prerequisite:* GEOG 530.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

*Open only to* majors in geography and related fields.

**653 Geography of Indiana. (3)** A geographic examination of the physical, cultural, and economic diversity of the state. Field experience with assigned projects supplements classroom activities.  
680 Distant Areas Field Studies. (1–6) Physical, economic, and cultural geography in areas distant from the campus. Includes seminars arranged during travel.

*Prerequisite:* permission of the department chairperson.

A total of 12 hours of credit may be earned, but no more than 6 in any one semester or term.

*Open only to* students in geography, earth science, and allied subjects.

**690 Professional Internship. (1–3)** Paid or unpaid supervised field and laboratory experience in public or private agencies.

A total of 3 hours of credit may be earned.

**695 Readings and Special Studies in Geography. (1–3)** Special assigned studies in various sub-fields of geography including readings and research projects.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

## GEOLOGICAL SCIENCES

[www.bsu.edu/geology](http://www.bsu.edu/geology)

Fine Arts Building 117, 765-285-8270

*Acting Chairperson:* R. Scott Rice-Snow

*Graduate Advisor:* Kirsten Nicholson

*Graduate Faculty:* Fluegeman, Grigsby, Neumann, Nicholson, Rice-Snow

### PROGRAMS

Master of Arts (MA) and Master of Science (MS) in geology and Master of Arts (MA) in earth science; the latter is cooperative with the Department of Geography.

See the Science listing under the College of Sciences and Humanities, page 160, for the doctoral programs in science education and philosophy in science.

### Admission

Applicants must meet the admission requirements of the Graduate School and have cumulative undergraduate grade point averages (GPA) of at least 2.75 overall or 3.0 for their junior and senior years and Graduate Record Examination (GRE) scores of at least 470 verbal, 530 quantitative, and 520 analytical (or an acceptable combination of GPA and GRE scores). Candidates must have completed acceptable geology field courses as undergraduates or must complete a Ball State field course as part of the master's requirements.

### MASTER OF ARTS IN GEOLOGY

#### Degree Requirements

Requires 30 hours of graduate courses, and passing the following National Association of State Boards of Geology (ASBOG) tests: the Fundamentals of Geology Examination and the Practice of Geology Examination. Each student must register for the 1-credit Research Colloquium during each Fall and Spring Semester of full-time graduate study.

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Geology seminar requirement, 9 hours from				
GEOL	605	Sem Strat (3)		
GEOL	610	Sem Sediment (3)		
GEOL	626	Sem Tectonic (3)		
GEOL	660	Sem Hydrogeo (3)		
GEOL	670	Sem Geochem (3)		

GEOL	671	Sem Geomorph (3)		9
Research methods requirement				
GEOL	685	Geo Res Meth		3
Approved graduate electives in geology, including up to three counted credits from GEOL 500, Research Colloquium				9
Approved major or minor in a second discipline or GEOL and/or other approved electives				9
				30 hrs

## MASTER OF SCIENCE IN GEOLOGY

### Degree Requirements

Requires 30 hours of graduate courses. Each student must register for the 1-credit Research Colloquium during each Fall and Spring Semester of full-time graduate study, and write a thesis which fulfills 6 hours of the 30-hour requirement. In a normal course of study, students are required to determine the thesis topic by the end of the second semester. The completed thesis document is subject to approval by the committee following a public oral defense.

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Geology seminar requirement, 9 hours from				
GEOL	605	Sem Strat (3)		
GEOL	610	Sem Sediment (3)		
GEOL	626	Sem Tectonic (3)		
GEOL	660	Sem Hydrogeo (3)		
GEOL	670	Sem Geochem (3)		
GEOL	671	Sem Geomorph (3)		9
Thesis requirement				
THES	698	Thesis (1–6)		6
Approved graduate electives in geology, including up to three counted credits from GEOL 500, Research Colloquium				6
An approved major or minor in a second discipline or GEOL and/or other approved electives				9
				30 hrs

### GEOLOGY (GEOL)

**500 Research Colloquium. (1)** Presentations on geological science research topics by faculty, students, and visiting professional speakers. Enrolled by every departmental graduate degree candidate, each semester in residence.

A total of 8 hours of credit may be earned, but no more than 1 in any one semester or term.

**502 Global Positioning System Techniques. (1)** Global Positioning System (GPS) surveying and mapping techniques. Overview of satellite and system technology, examination of various GPS units

available for applications, techniques using units individually or in combination for mapping and navigation, differential GPS methods, use in computer-generated maps.

*Prerequisite:* permission of the department chairperson.

A total of 3 hours of credit may be earned, but no more than 1 in any one semester or term.

**508 Advanced Invertebrate Paleontology. (3)** Advanced study of the important fossil invertebrate phyla (Coelenterata, Bryozoa, Brachiopoda, Mollusca, Arthropoda, and Echinodermata). Emphasizes individual study of selected fossil groups. Local field trip. Regularly scheduled laboratory.

*Not open to students who have credit in GEOL 308.*

**509 Micropaleontology. (3)** Morphology, classification, preparation techniques, and evolution of paleontologically significant microfossil groups and their biostratigraphic and paleoecologic significance. Emphasizes individual study of foraminifera, conodonts, and ostracodes. Regularly scheduled laboratory.

*Not open to students who have credit in GEOL 409.*

**510 Igneous and Metamorphic Petrology. (3)** Igneous and metamorphic petrology is an introduction to the processes responsible for, and the rocks and minerals associated with, the formation of both igneous and metamorphic rocks. Looks at the microscopic to macroscopic features associated with these processes. Laboratory section required.

*Prerequisite:* GEOL 220, 310, or permission of the department chairperson.

*Not open to students who have credit in GEOL 410.*

**512 Sedimentary Petrology. (3)** A petrographic approach to the classification and genetic interpretation of sedimentary rocks. Terrigenous sandstones and carbonate rocks will be emphasized with lesser stress on mud rocks and noncarbonate chemical rocks.

*Prerequisite:* GEOL 102, 220, 310, or permission of the department chairperson.

*Not open to students who have credit in GEOL 412.*

**516 Engineering Geology. (3)** Engineering properties and mechanics of rocks and soil; geologic materials in construction; applied geophysics for subsurface exploration; groundwater engineering problems; dams, tunnels, mines, shoreline structures, and other special construction problems; erosion and mass wasting. Regularly scheduled laboratory.

*Prerequisite:* GEOL 102; MATHS 112 or permission of the department chairperson.

*Not open to students who have credit in GEOL 416.*

**520 Geological and Physical Oceanography. (3)** Description of geological and physical characteristics of the oceans, marine processes, and related topics.

*Prerequisite:* GEOL 101 or its high school equivalent or permission of the department chairperson.

*Not open to students who have credit in GEOL 420.*

**525 Geophysics. (3)** An introduction to the physics of the earth and the geophysical sciences. Refraction and reflection seismology, magnetic, electrical, gravity, radioactivity, and geothermal methods are included in lecture topics, laboratory exercises, and field investigations. Emphasizes the application of geophysical methods to energy, mineral and ground-water exploration, site evaluation, pollution detection, and other applied problems.

*Not open to students who have credit in GEOL 425.*

**535 Stratigraphy and Subsurface Methods. (3)** Principles and practices of lithostratigraphy, biostratigraphy, and sequence stratigraphy. Use of surface and subsurface stratigraphic data in the reconstruction of depositional environments and sedimentary basins.

*Prerequisite:* GEOL 102, 220, 310, or permission of the department chairperson.

*Not open to* students who have credit in GEOL 435.

*Open only to* graduate students.

**545 Fractals in the Natural Sciences. (3)** Fractal geometric models and data analysis methods of practical use in the sciences. Application examples drawn from geosciences and other natural science fields. Divider, box, size-number, variogram, and rescaled range methods, along with other techniques. Discussion of chaos and self-organized criticality as possible sources of fractals in nature.

*Prerequisite:* MATHS 108.

*Not open to* students who have credit in GEOL 445.

**550 Geology of Indiana. (3)** Rocks, structure, fossils, landforms, economic resources, and geologic history of Indiana. Designed for students, particularly teachers, not majoring in the earth sciences. Field-trip oriented with collection of rock, mineral, and fossil specimens.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

*Not open to* students who have credit in GEOL 450.

**560 Hydrogeology. (3)** Occurrence and movement of surface water and groundwater, with special reference to the effect of the geologic environment.

*Prerequisite:* GEOL 102 or 207 or 240 or NREM 211; MATHS 108 or permission of the department chairperson.

*Not open to* students who have credit in GEOL 460.

**570 Groundwater Geochemistry. (3)** Introduces the processes controlling the composition of natural waters: streams, lakes, oceans, and near-surface ground-waters. Focuses on the effect of human activities, biological systems, and inorganic geochemistry processes on water chemistry.

*Prerequisite:* GEOL 101; CHEM 111, 112; or permission of the department chairperson.

*Not open to* students who have credit in GEOL 470.

**571 Volcanology and Volcanic Hazards. (3)** Designed to give middle- and upper-level students a working knowledge of the causes and effects of the various types of volcanism ranging from quiescent Hawaiian-style volcanoes to the explosive Southwest Pacific volcanoes. In addition, looks at volcanic prediction, monitoring, and hazard response programs.

*Prerequisite:* GEOL 102 or permission of the department chairperson.

**575 Glacial Geology. (3)** In-depth study of the physical nature of glaciers, their deposits, and the erosional and depositional landforms they create. Introduction to the glacial history of the north central United States. Term paper required.

*Prerequisite:* GEOL 240; PHYCS 110 or 120; or permission of the department chairperson.

*Not open to* students who have credit in GEOL 475.

**580 Special Studies and Field Problems. (1–3)** Selected detailed geologic problems under the guidance of a qualified instructor.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**583 Geology Field Camp. (6)** An immersion experience applying field techniques to the resolution of geologic problems. Group and individual projects include accumulation and interpretation of field observations and preparation of geologic maps, cross sections, and stratigraphic sections to answer geologic questions. Five-week summer course in the Rocky Mountains.

*Prerequisite:* GEOL 102, 220, 240, 290, 315; or permission of the department chairperson.

**590 Computer Applications in the Geosciences. (1)** Survey of the various computer applications in the geosciences. Designed to supplement existing geoscience and computer science courses by providing opportunity to gain experience in working with BASIC and FORTRAN programs in various geoscience data collection, calculation, and graphic display applications.

A total of 3 hours of credit may be earned, but no more than 1 in any one semester or term.  
*Not open to students who have credit in GEOL 290.*

**600 Seminar in Geology. (1–3)** Review and discussion of the literature related to a selected topic of current interest in geological research. Laboratory work and field trips may be included when necessary.

A total of 9 hours of credit may be earned, but no more than 3 in any one semester or term.

**601 Seminar in Environmental Geology. (1–3)** Review and discussion of the literature related to a selected topic of current interest in environmental geology. Laboratory work and field trips may be included when necessary.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**605 Seminar in Stratigraphy. (3)** Discussion of current topics in stratigraphy. Subjects may include global correlation, the record of sea level change, and global events in earth history.

**610 Seminar in Sedimentary Petrology. (3)** Advanced coverage of sedimentary rocks, their constituents, their environments of deposition, and the diagenetic processes that alter them after deposition. Proficiency in recognition of sedimentary constituents, in naming sedimentary rock types, and in interpretation of depositional, diagenetic, and provenance processes is expected.

*Prerequisite:* GEOL 412 or 512 or permission of the instructor.

**611 Regional Geology. (3)** Geologic history, geomorphology, structural geology, and special geologic topics of selected regions.

**626 Seminar in Tectonics. (3)** Origin and nature of tectonic processes affecting the crust and lithosphere. Plate dynamics and the tectonic evolution of orogens from a structural, petrologic, and geochronologic perspective.

*Prerequisite:* GEOL 315, 410, or 510 or permission of the instructor.

**660 Seminar in Advanced Hydrogeology. (3)** Seminar in advanced and contemporary topics in groundwater geology, such as pump and slug test analyses, analytic or numerical flow and transport computer modeling, wellhead protection policy, current groundwater resource and water quality research, and groundwater remediation.

*Prerequisite:* GEOL 460 or 560; permission of the department chairperson.

**670 Seminar in Environmental Geochemistry. (3)** Seminar in advanced and contemporary topics in aqueous geochemistry such as geochemical cycling with focus on the role of sediments, soils, freshwater streams and lakes, and oceans as reservoirs for chemical compounds, including natural and manmade contaminants.

*Prerequisite:* GEOL 470 or 570 or permission of the department chairperson.

**671 Seminar in Geomorphology. (3)** Review and critical discussion of key classic and recent literature in geomorphology. Student presentations and group project.

**680 Special Studies and Field Problems. (1–3)** Selected detailed geologic problems under the guidance of a qualified instructor.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**685 Geology Research Methods. (3)** Introduction to the use of scientific literature, design of research, analysis of data, and writing of research/grant proposals in a focused area of the geosciences. Review of literature pertinent to a special topic of student interest.

## HISTORY

[www.bsu.edu/history](http://www.bsu.edu/history)

Burkhardt Building 200, 765-285-8700

*Chairperson:* Bruce Geelhoed

*Coordinator of MA in History:* Kenneth Swope

*Coordinator of MA in Social Science:* Sarah Drake Brown

*Graduate Faculty:* Beswick, Connolly, de Waal-Laucas, Dmitriev, Doyle, Edmonds, Etcheson, Geelhoed, Glen, K. Hall, R. Hall, Malone, Mjagkij, Morris, Smith, Stephan, Suppe, Swope, Thompson, Witkowski, Zhuck

### PROGRAMS

The Master of Arts (MA) in history and in social science may serve as terminal degrees or as preludes to additional graduate degrees. In addition, either of the two degrees may be used to professionalize the standard secondary school teaching license. See Social Studies, page 213.

### MASTER OF ARTS IN HISTORY

#### Admission

Students must apply to and meet the admission requirements of the Graduate School. Students also must apply separately to the Department of History. All applicants must submit to the director a resume or curriculum vitae, original copies of all official undergraduate transcripts, a writing sample (typically their best undergraduate history paper), and a 300–500 word statement concerning goals and interests. Applicants normally should have earned at least a 3.0 grade point average (GPA) on a scale of 4.0 in a minimum of 18 semester hours in undergraduate history courses. To qualify for a graduate assistantship in the department, applicants must take the Graduate Record Examination (GRE) general test and ordinarily have an undergraduate GPA of at least 3.0 on a scale of 4.0.

#### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Required Core				
HIST	612	Sem Historio	3	
HIST	613	Sem Hist Res	3	
Directed electives				
A minimum of five courses in American, European, and/or world history distributed over a minimum of two areas. Students must select from the following courses:				
American History				
HIST	621	Amer to 1877 (3)		
HIST	622	Amer frm 1877(3)		
HIST	623	Spec Top Am (3–6)		
European History				

HIST	631	Std Erly Eur (3)		
HIST	632	Std Mod Eur (3)		
HIST	633	Spec Top Eur (3–6)		
World History				
HIST	641	Std Wrld His (3)		15
Two 500- or 600-level courses in history or with approval in related fields				6
				27 hrs

### *Thesis option*

Any student may choose to write a thesis. The history department strongly recommends that students who intend to continue their graduate education at the doctoral level write a thesis.

THES 698          Thesis (1–6)          6

or

### *General option*

Students who choose not to write a thesis must complete 6 additional hours of 600-level course work in lieu of a thesis. 600-level course work          6

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33 hrs

## **MA Examination**

All students must take a three-hour written examination in a field in one of three geographic areas. The written exam is followed by a one-hour oral examination. Students must take at least three courses (9 hours) in the MA exam field, at least two of which (6 hours) must be at the 600 level. Students will complete at least two courses (6 hours) in a complementary field from a different geographic area. At least one of those courses (3 hours) must be at the 600 level. In the course of completing the 6 hours in his or her complementary field, the student must complete an essay of approximately 20 pages on a topic to be determined in consultation with a faculty member.

## **HISTORY (HIST)**

**500 Colonial America, 1492–1756. (3)** The settlement of North America by the British and the evolution of the distinctive colonial societies that formed the foundations of the United States.

*Not open to students who have credit in HIST 400.*

**501 The American Revolution, 1756–1789. (3)** Transformation of American society and politics in the era of the American Revolution with emphasis on the origins of the revolution, the development of a democratic society, and the Constitution of the United States.

*Not open to students who have credit in HIST 401.*

**503 The Rise of Nationalism in the United States, 1789–1824. (3)** The foundations of the United States as a new nation with emphasis on the major social, political, economic, and diplomatic events of the period.

*Not open to students who have credit in HIST 403.*

**505 Nationalism versus Sectionalism in the United States, 1820–1860. (3)** The major social, political, economic, and cultural developments in the United States with emphasis on the major leaders and events involved in the sectional conflict leading to the Civil War, 1820–1860.

*Not open to students who have credit in HIST 405.*

**507 The American Civil War and Reconstruction. (3)** Events, leaders, and movements, with special emphasis on causes, interpretation, and historiography of the period of national crisis and war followed by national reconstruction.

*Not open to students who have credit in HIST 407.*

**509 Progressivism and Imperialism: The United States, 1878–1918. (3)** America's rise to world significance at home and abroad between 1878 and 1918; the political, social, and economic problems and various efforts at reform.

*Not open to students who have credit in HIST 409.*

**511 The United States from World War I through World War II. (3)** An examination of the reaction of the American people to a society changing rapidly under the impact of two major wars, the Great Depression, and continuing industrialization and urbanization.

*Not open to students who have credit in HIST 411.*

**513 Recent United States History: 1945 to the Present. (3)** The role of the United States in the modern world. Examines the efforts of Americans to preserve a society that is prosperous and humane while it adjusts to technological change and continuing social and intellectual ferment.

*Not open to students who have credit in HIST 413.*

**515 History of Indiana. (3)** Exploration, colonization, and development of the state from the earliest time to the present.

*Prerequisite:* 6 hours of credit in United States history.

*Not open to students who have credit in HIST 415.*

**516 History of the Antebellum South. (3)** History, institutions, political themes, and problems of the antebellum South.

*Not open to students who have credit in HIST 416.*

**517 History of the New South. (3)** Reconstruction, industrial and agricultural progress, social life, and the new leadership after 1865.

*Not open to students who have credit in HIST 417.*

**519 The Trans-Mississippi Frontier. (3)** American territorial expansion in the region west of the Mississippi River, with emphasis on the nineteenth century. Exploration, the movement of settlers, the events that influenced their migration, and the effect of these events and the frontier on national development.

*Not open to students who have credit in HIST 419.*

**520 The African American Experience in America. (3)** The African American experience in America from the sixteenth century to the present. Emphasizes the effect of African Americans on American culture and vice versa.

*Not open to students who have credit in HIST 210.*

**521 Indians in United States History. (3)** Indian and white relations from 1492 to the present; the Indian wars, treaty making, various types of Indian and Caucasian interaction, and the development of federal and state Indian policy.

*Not open to students who have credit in HIST 421.*

**529 Colloquium in Latin American History. (3–6)** Selected topics in the history of Mexico, the Caribbean, and the Spanish borderlands.

A total of 6 hours of credit may be earned.

**530 United States Diplomatic History to 1914. (3)** History of United States diplomacy from the late colonial period to the eve of World War I.

*Not open to students who have credit in HIST 430.*

**532 United States Diplomatic History Since 1914. (3)** The foreign relations of the United States since the outbreak of World War I.

*Not open to students who have credit in HIST 432.*

**533 American Life and Thought, 1607–1865. (3)** American social, intellectual, and cultural history from the colonial period to the Civil War, including such topics as religion, women, the family, ethnic groups, minorities, the arts, thought, popular culture, and everyday life.

*Not open to students who have credit in HIST 433.*

**534 American Life and Thought, 1865 to the Present. (3)** American social, intellectual, and cultural history from Reconstruction to the present, including such topics as religion, women, the family, ethnic groups, minorities, the arts, thought, popular culture, and everyday life.

*Not open to students who have credit in HIST 434.*

**535 American History through Film. (3)** Introduces the techniques needed to analyze films as primary documents in United States history. Focuses on the most significant feature and documentary films of American society. Compares and contrasts filmic and historical reality.

*Not open to students who have credit in HIST 435.*

**538 Colloquium on United States Urban History. (3)** The literature of American urban history, presented topically rather than chronologically. Students will select readings from a list compiled especially for the course and tailored to the exact number of students. They will then discuss their own special assignments each week so that greater exposure and interchange will be possible.

**541 Comparative Slavery. (3)** Explores the types of bondage, unfree labor systems, and slavery and the slave trade throughout African history as well as in a number of geographical regions for comparison. Includes Africa, the Mediterranean, the Caribbean, and Central and South America.

*Prerequisite:* permission of the department chairperson.

*Not open to students who have credit in HIST 441.*

**549 American Culture Field Studies. (3–6)** American culture, its art, economic life, educational systems, geography, history, industry, languages, music, and society. Students will travel through designated areas in North America. Before the trip, considerable reading in various fields pertinent to the course will be required. At the conclusion, papers will be required.

A total of 6 hours of credit may be earned.

*Not open to students who have credit in HIST 449.*

**553 Modern Western Culture. (3–6)** Selected studies in the development of cultural and intellectual movements in the fine arts, literature, scholarship, political and economic thought, science, and social reform from the eighteenth century to the present. Emphasizes themes and problems of major significance.

A total of 6 hours of credit may be earned.

**554 The Era of World War I, 1870–1918. (3)** The background, immediate causes, and course of the First World War with special attention to nationalism, the alliance system, imperialism, militarism, and conflicts of interest and aspirations.

*Not open to students who have credit in HIST 454.*

**555 The Era of World War II, 1918–1945. (3)** The origins, immediate causes, and the course of the Second World War with stress on the peace settlement of 1919, revisionism, diplomatic conflicts, and the foundations of the postwar world.

*Not open to students who have credit in HIST 455.*

**556 Cold War and Europe Since 1945. (3)** European origin of the Cold War and rebirth of a “new” but divided Europe with stress on East–West conflict, power blocs, international relations, and temporary decline of European influence; ideological, political, economic, and social development, including competition between Western and Sovietized Eastern Europe.

*Not open to students who have credit in HIST 456.*

**558 Strategy and Diplomacy of the European Great Powers Since 1860. (3)** Examines, interprets, and evaluates British, German, Russian, French, Italian, and Austrian strategy and diplomacy—and economic, geographic, ideological, and military foundations of national power—focusing upon the “German Question,” Eurocentrism, imperialism, two world wars, renewed multipolarity, the European Community, and the Cold War.

*Not open to students who have credit in HIST 458.*

**559 The Jews in Europe and the Middle East, 1098 to the Present. (3)** Survey of the Jewish role in European and Middle Eastern history and society. Focus will be on the commonalities and differences among Judaism, Christianity, and Islam and changing attitudes toward the Jewish community in the nineteenth and twentieth centuries.

*Not open to students who have credit in HIST 459.*

**561 Development of Greek Civilization. (3)** Greek political, social, and intellectual development in the Hellenic and Hellenistic periods. Emphasizes the rise and fall of Greek democracy and Greek contributions to the civilizations and cultures of the West.

*Not open to students who have credit in HIST 461.*

**562 Development of Roman Civilization. (3)** Political, social, and intellectual development of Rome from the beginning of the republic to approximately AD 500. Emphasizes development of Roman characteristics during the republic, effects of Greek ideas and imperial expansion, and Roman contributions to Western civilization.

*Not open to students who have credit in HIST 462.*

**564 Development of Byzantine Civilization. (3)** Political, socioeconomic, and intellectual development of the Byzantine Empire from its origins to 1453. Emphasizes Byzantine religious and cultural contributions and relations with Western Europe, the Slavic peoples, and the Muslim world.

*Not open to students who have credit in HIST 464.*

**565 Medieval Ideas and Institutions. (3)** Selected problems concerning the social and cultural bases of medieval civilization. Emphasizes six major institutions and themes—feudalism, chivalry, manorialism, the medieval city, the church, and the medieval university.

**567 The Renaissance and Reformation, 1300–1600. (3)** Specialized study of the crises, changes, and cultural achievements of Europe in an age of transition and intellectual upheaval. Individual investigations combined with a colloquium approach.

**569 World Civilizations—Field Studies. (3–6)** World civilizations—their history, art, economic life, educational systems, geography, industry, languages, music, and society—through varied travel programs. Advance reading and a summary paper are required to complement each year’s travel program.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.

*Not open to* students who have credit in HIST 469.

**571 France Since 1815. (3)** The political, intellectual, and social development of modern France—the problems of revolution and reaction, imperial growth, republican reform and stabilization, state power and individual freedom, capitalism, and socialism.

*Not open to* students who have credit in HIST 471.

**572 France—The Classical Age, 1461–1715. (3)** The foundations and institutions of French absolutism through Louis XIV—classic culture, the monarchy, the aristocracy, the bourgeoisie, Gallican Catholicism—with emphasis on development of the ancient regime and French influence on Europe.

*Not open to* students who have credit in HIST 472.

**573 French Revolutionary and Napoleonic Eras, 1715–1815. (3)** Investigations of the causes of the French Revolution—the great turning point of modern civilization—with particular stress on nationalism, authority, individual freedom, reform measures, social change, and other significant forces.

*Not open to* students who have credit in HIST 473.

**575 Britain, 1485–1714. (3)** A survey of the political, social, and economic history of England in the Tudor and Stuart periods. Emphasizes the rise of the national state, religious conflicts, the development of the power of Parliament, and overseas exploration and colonization.

*Not open to* students who have credit in HIST 475.

**576 Britain, 1714 to the Present. (3)** Survey of the many changes in British life from the Hanoverian period to the present—modernization of political institutions, evolution of the limited monarchy, industrialization and social conflict, effects of imperialism and recent wars, problems of government and society since World War II.

*Not open to* students who have credit in HIST 476.

**577 Topics in English Constitutional History. (3)** Selected topics concerning the constitutional history of England, such as the development of the kingship, the common law, Parliament, the Tudor and Stuart theories of government, the cabinet system, and political parties.

*Not open to* students who have credit in HIST 477.

**581 Modern Germany. (3)** Critical problems in modern German history with concentration on unification and the age of Bismarck, the First World War, cultural and intellectual ferment, Hitler and the Nazi period, and postwar West and East Germany.

*Not open to* students who have credit in HIST 481.

**582 Research on the History of the Celtic Peoples. (3)** Surveys the entire chronological and geographical framework of the history of the Celtic peoples and their distinctive and persistent culture. Introduces recent scholarship and graduate-level research on a topic of the student’s choice.

*Not open to* students who have credit in HIST 482.

**583 Research in Irish History. (3)** Surveys the entire span of Irish history and introduces recent historiography and graduate-level research on a topic of the student’s choice.

*Not open to* students who have credit in HIST 483.

**584 Southern Africa. (3)** Explores the arrival of the Europeans in the southern tip of Africa from 1652 and focuses on the subsequent four centuries of colonial domination of much of the southern African continent. Also investigates Black, Indian, and Colored resistance.

*Prerequisite:* permission of the department chairperson.

*Not open to students who have credit in HIST 484.*

**586 Tzarist Russia. (3)** Development of the Russian state and people from about 1500 to the Revolution of 1917— evolution of political institutions, cultural and religious life, economic and social change, geographic expansion, and foreign affairs.

*Not open to students who have credit in HIST 486.*

**587 The Soviet Union. (3)** The development of the Soviet Union from the Bolshevik Revolution of 1917 to the present, with emphasis on Soviet political and economic institutions and the role of the U.S.S.R. in world affairs.

*Not open to students who have credit in HIST 487.*

**588 History of South Asia. (3)** Descriptive and analytical survey of the subcontinent of South Asia, comprising India, Pakistan, Bangladesh, and Sri Lanka, from early times to the present.

*Not open to students who have credit in HIST 488.*

**589 History of Southeast Asia. (3)** History of the region from earliest times to the present, with special attention to the formation of the earliest civilizations; the influence of Indian, Chinese, and European cultures upon the people of Southeast Asia; and the processes of synthesis that have taken place within these civilizations through the centuries.

*Not open to students who have credit in HIST 489.*

**591 Topics in Middle Eastern History. (3)** Selected issues and problems in the Middle Eastern world since Muhammad. Topics may include the expansion of Islam, slavery in the Middle East, the economic and social history of the Ottoman empire, the Arab/Israeli dispute, and recent national and international crises.

*Not open to students who have credit in HIST 491.*

**592 History of China to 1600. (3)** Descriptive and analytical survey of China's history from earliest times to roughly AD 1600, with emphasis on the development of the dynastic tradition, Confucian-based society and culture, and China's focal point status in the pre-1600 world order.

*Not open to students who have credit in HIST 492.*

**593 History of Premodern Japan. (3)** Analytical survey of premodern Japanese history to ca. 1600, focusing on the ideological, political, social, economic, and cultural developments that provide a foundation for the understanding of modern Japan.

*Not open to students who have credit in HIST 493.*

**595 Modern China, 1600 to the Present. (3)** Descriptive and analytical survey with emphasis on China's changing role as a member of the world community, its response to increased Western contacts, disintegration of traditional order, revolutionary changes through the Republic of China and the People's Republic, and significant elements of contemporary Chinese society and culture.

*Not open to students who have credit in HIST 495.*

**596 Modern Japan, 1600 to the Present. (3)** Descriptive and analytical survey of political and economic developments, foreign policy, and social and cultural change in modern Japan with emphasis on

conditions contributing to its rapid modernization, nationalist and expansionist movements, and dynamic postwar recovery.

*Not open to students who have credit in HIST 496.*

**612 Seminar in Modern Historiography. (3)** A survey of the major works in the historical literature of the past five centuries, including both European and American contributions, with special investigation of significant historians and movements in historical studies and writing.

**613 Seminar in Historical Research. (3)** Designed to further investigative skills. Focuses on the knowledge of concepts and methodology used in historical research through the intensive study of a selected topic in American, European, or world history. A research paper is required.

*Prerequisite:* HIST 612; permission of the MA advisor in history.

**621 Studies in American History to 1877. (3)** Studies of selected problems in American history to 1877 with special attention to discussion of historiography and current trends in scholarship. Exact content will be announced before each offering.

**622 Studies in American History Since 1877. (3)** Studies of selected problems in American history since 1877 with special attention to discussion of historiography and current trends in scholarship. Exact content will be announced before each offering.

**623 Special Topics in American History. (3–6)** Investigation of a particular topic, problem, or issue in American history with emphasis on topics, specialties, and materials not covered in other courses. Exact content will be announced before each offering.

A total of 6 hours of credit may be earned.

**631 Studies in Early European History. (3)** Studies of selected problems in early European history with special attention to discussion of historiography and current trends in scholarship. Exact content will be announced before each offering.

**632 Studies in Modern European History. (3)** Studies of selected problems in modern European history with special attention to discussion of historiography and current trends in scholarship. Exact content will be announced before each offering.

**633 Special Topics in European History. (3–6)** Investigation of a particular topic, problem, or issue in European history with emphasis on topics, specialties, and materials not covered in other courses. Exact content will be announced before each offering.

A total of 6 hours of credit may be earned.

**641 Studies in World History. (3)** Studies of selected problems in world history with special attention to discussion of historiography and current trends in scholarship. Exact content will be announced before each offering.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**650 Special Studies. (1–6)** Directed study of special problems by individuals or groups of students. Ordinarily not available until students have earned 12 hours of graduate credit in history.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned with permission of the department chairperson.

## **SOCIAL STUDIES (SS)**

**650 Independent Study in Social Science Education. (1–6)** Directed study of special problems or research in social science education by individuals or groups of students. Topics to be investigated will be chosen after consultation with an instructor with special competence in the topic involved.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.

**670 Applying Media Resources to Social Science Education. (3)** Selecting, developing, and incorporating media into a systematic plan for instruction in the social sciences. Designed to aid in the enrichment of teaching through appropriate use of instructional media.

**688 Using Community Resources in Teaching Social Studies. (3)** Techniques and practice in finding, analyzing, organizing, and grading materials pertaining to political, economic, and social activities of the community and their historical development for use at the various grade levels.

**690 Selection and Organization of Social Studies Teaching Materials. (3)** Recent curriculum materials examined in the light of learning theory, methods of teaching, content emphasis, and rationale. Criteria for comparing and evaluating curriculum materials are developed.

**691 Teaching Social Studies Skills in Secondary Schools. (3)** Preparation for teaching social studies skills to meet individual and group needs. Emphasizes skills related to problem solving, critical thinking, reading and interpreting materials, using pictorial representations, and finding and using information.

**692 Teaching Social Studies Skills in Junior High/Middle Schools. (3)** Preparation for teaching social studies skills to meet individual and group needs. Emphasizes skills related to problem solving, critical thinking, reading and interpreting materials, using pictorial representations, and finding and using information.

**694 Seminar in Social Studies Curriculum and Instruction. (1–5)** Research and investigative techniques will be developed through the intensive study of a topic within the framework of social studies curriculum and instruction. Some of the topics studied are goals, methodology, content, evaluation, development and revision of curricula, and teacher education in social studies. A research paper is required.

A total of 5 hours of credit may be earned.

**695 Recent Trends in Teaching Secondary School Social Studies. (3)** Issues and teaching strategies developed in view of the findings of current research in social science education. Considers such topics as developing goals, organizational patterns, values clarification, inquiry teaching, and evaluative procedures in teaching social studies. Designed for experienced teachers.

**697 Seminar in Social Science Education. (1–5)** The discussion of current issues and research in one branch of the social studies, such as value analysis, method of inquiry, critical thinking, methods in the inner city.

A total of 5 hours of credit may be earned.

## MATHEMATICAL SCIENCES

[www.bsu.edu/math](http://www.bsu.edu/math)

Robert P. Bell Building 465, 765-285-8640

*Chairperson:* Sheryl Stump

*Graduate Advisor in Statistics:* Dale Umbach

*Graduate Advisor in Actuarial Science:* C. Gary Dean

*Graduate Advisor in Mathematics:* Roger B. Nelson

*Graduate Advisor in Mathematics Education:* Annette Leitze

*Graduate Faculty:* Begum, Bremigan, Dean, Emert, Fischer, Foley, Imon, Jenkins, Karls, Leitze,

Livshits, Lorch, Mascioni, Mohammed, Pierce, Roebuck, Shafer, Stankewitz, Stump, Umbach, Whitaker

## PROGRAMS

Master of Arts (MA) in actuarial science, in mathematics, in mathematics education, and in statistics;  
master of science (MS) in mathematics

See the Science listing under the College of Sciences and Humanities, page 209, for the doctoral programs in science education and philosophy in science.

## MASTER OF ARTS IN ACTUARIAL SCIENCE

The master's program in actuarial science provides training for careers that involve analyzing and solving financial, business, and social problems related to economic risk. The program includes course work that prepares students for the professional examinations given by the Society of Actuaries and the Casualty Actuary Society.

### Admission

Applicants must meet admission requirements of the Graduate School. It is also expected that students will have had three semesters of calculus, a course in linear algebra, and at least one semester of probability and statistics.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
MATHS	551	Math Finance	4	
MATHS	552	Life Cont 1	4	
MATHS	620	Math Stat 1	4	
MATHS	659	Res Act Sci	3	
RMI	570	Risk Mgt Ins (3)		
<i>or</i>				
RMI	597	Indpen Study (1-6)		3
14-16 hours from				
MATHS	528	Reg Time Ser (3)		
MATHS	553	Life Cont 2 (4)		
MATHS	554	Math Invest (4)		
MATHS	557	Act Model 1 (4)		
MATHS	558	Act Model 2 (3)		
MATHS	621	Math Stat 2 (4)		
MATHS	655	Top Act Sci (4)		
MATHS	658	Risk Theory (4)		14-16
Electives (To be taken if required courses are waived because of undergraduate credit)				
MATHS	555	Prob in Act (2)		

MATHS	625	Prob Theor 1 (3)		
MATHS	626	Prob Theor 2 (3)		0-8
				32-34 hrs

## MASTER OF ARTS IN MATHEMATICS

The master of arts degree in mathematics provides students with a broad graduate-level mathematical background suitable for community college teaching, for pursuing a PhD degree in the mathematical sciences, or for seeking employment in business, industry, or government.

### Admission

Applicants must meet the regular admission requirements of the Graduate School and have an undergraduate major in mathematics or an equivalent background as determined by the Department of Mathematical Sciences.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
MATHS	511	Abstr Alg 1	3	
MATHS	512	Abstr Alg 2	3	
(If the undergraduate equivalent is not completed. Otherwise select from the following to complete at least 6 semester hours.)				
MATHS	516	Thry Numbers (3)		
MATHS	619	Spec Stu GAT (1-8)		
6 hours from				
MATHS	571	Real Anls 1 (3)		
MATHS	572	Real Anls 2 (3)		
MATHS	675	Real Varbl 1 (3)		
MATHS	676	Real Varbl 2 (3)		
MATHS	677	Complx Var 1 (3)		
MATHS	678	Complx Var 2 (3)		6
6-8 hours from				
MATHS	556	Oper Res (3)		
MATHS	562	Numer Anls 1 (3)		
MATHS	563	Numer Anls 2 (3)		
MATHS	573	Bdry Val Pbm (3)		
MATHS	575	P D E (3)		
MATHS	620	Math Stat 1 (4)		
MATHS	621	Math Stat 2 (4)		
MATHS	625	Prob Theor 1 (3)		
MATHS	626	Prob Theor 2 (3)		
MATHS	641	Topics Geom (3)		
MATHS	645	Topology 1 (3)		
MATHS	646	Topology 2 (3)		6-8
Research component, 3-6 hours from				
MATHS	689	Res Mth Stat (3)		

	694	Res Math Ed (3)		
THES	698	Thesis (1-6)		3-6
Electives as directed by advisor				4-9
				30 hrs

Of the 30 total credit hours at least 12 must be taken at the 600-level or higher.

## MASTER OF ARTS IN MATHEMATICS EDUCATION

The master of arts in mathematics education provides opportunities for elementary, middle school, and high school teachers to examine various issues related to the teaching and learning of mathematics while continuing to develop their own mathematical content knowledge.

*Option 1: Elementary and middle school mathematics*

### Admission

Applicants must meet the regular admission requirements of the Graduate School; hold a current elementary, middle school, or special education teaching license; and have at least one year of elementary or middle school teaching experience.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Mathematics content, 3–12 hours				
MATHS	623	Data Anl Tch	3	
And each of the following unless the undergraduate equivalent is completed				
MATHS	514	Alg Fns Tch	3	
	517	Nmbr Sys Tch	3	
	542	Geo Meas Tch	3	
Mathematics education, 9 hours				
MATHS	690	C I Math Ed	3	
	694	Res Math Ed	3	
	696	Act Res Meth	3	
Electives in mathematics or mathematics education, 9–18 hours (as approved by advisor) from				
MATHS	631	Tech Mth Tch (3)		
	632	Assmt Mth Ed (3)		
	641	Topics Geom (3)		
	671	Con Disc Tch (3)		
	680	Studies Tchg (3)		
	691	Dev Ins Math (3)		
	693	Prob & Com (3)		
	695	Learn Th Mth (3)		
	697	Lead Math Ed (3)		9-18
				30 hrs

*Option 2: Secondary mathematics*

## Admission

Applicants must meet the regular admission requirements of the Graduate School; have an undergraduate major in mathematics or an equivalent background as determined by the Department of Mathematical Sciences; hold a current secondary mathematics teaching license; and have at least one year of secondary mathematics teaching experience.

## Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Mathematics content, 15 hours				
MATHS	641	Topics Geom	3	
Take each of the following unless the undergraduate equivalent is completed.				
MATHS	511	Abstr Alg 1	3	
MATHS	571	Real Anls 1	3	
Electives in mathematics content, 6–12 hours (as approved by advisor) from the following (if undergraduate equivalent is not completed)				
MATHS	512	Abstr Alg 2(3)		
MATHS	516	Thry Numbers (3)		
MATHS	560	Hist of Math (3)		
MATHS	572	Real Anls 2 (3)		
MATHS	620	Math Stat 1 (4)		
MATHS	621	Math Stat 2 (4)		
MATHS	623	Data Anl Tch (3)		
MATHS	645	Topology 1 (3)		
MATHS	675	Real Varbl 1 (3)		
MATHS	677	Complx Var 1 (3)		6-12
Mathematics education, 15 hours				
MATHS	690	C I Math Ed	3	
MATHS	694	Res Math Ed	3	
MATHS	696	Act Res Meth	3	
Electives in mathematics or mathematics education, 6 hours (as approved by advisor) from				
MATHS	631	Tech Mth Tch (3)		
MATHS	632	Assmt Mth Ed (3)		
MATHS	693	Prob & Com (3)		
MATHS	695	Learn Th Mth (3)		
MATHS	697	Lead Math Ed (3)		6
				30 hrs

## MASTER OF ARTS IN STATISTICS

The master's program in statistics provides students with the background suitable for employment as a statistician in business, industry, or government. The degree also provides suitable preparation for pursuing a PhD degree in statistics.

## Admission

Applicants must meet admission requirements of the Graduate School. It is also expected that students will have had three semesters of calculus and a course in linear algebra.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
MATHS	522	Sampling	3	
MATHS	528	Reg Time Ser	3	
MATHS	529	Exp Designs	3	
MATHS	620	Math Stat 1	4	
MATHS	621	Math Stat 2	4	
MATHS	625	Prob Theor 1	3	
MATHS	626	Prob Theor 2	3	
MATHS	628	Monte Carlo	4	
MATHS	689	Res Mth Stat	3	
				30 hrs

### MASTER OF SCIENCE IN MATHEMATICS

The master of science degree in mathematics provides students with a broad graduate-level mathematical background suitable for community college teaching, for pursuing a PhD degree in the mathematical sciences, or for seeking employment in business, industry, or government. Students pursuing the master of science degree will be required to write a 6-hour thesis.

### Admission

Applicants must meet the regular admission requirements of the Graduate School and have an undergraduate major in mathematics or an equivalent background as determined by the Department of Mathematical Sciences.

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
MATHS	511	Abstr Alg 1	3	
MATHS	512	Abstr Alg 2	3	
(If the undergraduate equivalent is not completed. Otherwise select from the following to complete at least 6 semester hours.)				
MATHS	516	Thry Numbers (3)		
MATHS	619	Spec Stu GAT		1-8
<i>6 hours from</i>				
MATHS	571	Real Anls 1 (3)		
MATHS	572	Real Anls 2 (3)		
MATHS	675	Real Varbl 1 (3)		
MATHS	676	Real Varbl 2 (3)		
MATHS	677	Complex Var 1 (3)		

MATHS	678	Complx Var 2 (3)		6
<i>6-8 hours from</i>				
MATHS	556	Oper Res (3)		
MATHS	562	Numer Anls 1 (3)		
MATHS	563	Numer Anls 2 (3)		
MATHS	573	Bdry Val Pbm (3)		
MATHS	575	P D E (3)		
MATHS	620	Math Stat 1 (4)		
MATHS	621	Math Stat 2 (4)		
MATHS	625	Prob Theor 1 (3)		
MATHS	626	Prob Theor 2 (3)		
MATHS	641	Topics Geom (3)		
MATHS	645	Topology 1 (3)		
MATHS	646	Topology 2 (3)		6-8
THES	698	Thesis (1-6)		6
Electives as directed by the advisor				4-6
				30 hrs

Of the 30 total credit hours at least 12 must be taken at the 600-level or higher.

### Facilities

The Department of Mathematical Sciences is in the Robert P. Bell building, with offices, conference and seminar rooms, and computer facilities. Among the advantages of the department's four programs are small class sizes that permit students to develop close working relationships with faculty and to interact frequently with their peers, opportunities to conduct studies under the direction of scholars well established in their specializations, and an excellent record of graduate placement.

Faculty involved with the programs are active in various state, national, and inter-national professional organizations, possess extensive and varied work experience, and regularly publish their research works in national and international journals.

### Admission

Applicants must meet the regular admission requirements of the Graduate School; hold a current elementary, middle school, or special education teaching license; and have at least one year of elementary teaching experience.

Students who are currently enrolled in the Graduate School in a program other than the master of arts in mathematics education and who wish to pursue this certificate must apply for admission to the program before six of the credits toward this certificate are completed.

C or better grade required in each course. A 3.0 grade point average (GPA) must be earned in the certificate courses.

### GRADUATE CERTIFICATE IN ELEMENTARY MATHEMATICS TEACHER LEADERSHIP

Prefix	Number	Short Title	Course Credit Hrs	Program Required
MATHS	514	Alg Fns Tch	3	

MATHS	690	C I Math Ed	3	
MATHS	697	Lead Math Ed	3	

<i>3 hours from</i>				
MATHS	517	Nmbr Sys Tch (3)		
MATHS	542	Geo Meas Tch (3)		
MATHS	623	Data Anl Tch (3)		3
<i>3 hours from</i>				
MATHS	631	Tech Mth Tch (3)		
MATHS	632	Assmt Mth Ed (3)		
MATHS	691	Dev Ins Math (3)		
MATHS	693	Prob & Com (3)		
MATHS	694	Res Math Ed (3)		
MATHS	695	Learn Th Mth (3)		3
				15 hrs

### MIDDLE SCHOOL/JUNIOR HIGH MATHEMATICS LICENSE (GRADUATE LEVEL)

*Open only to* candidates who currently hold an elementary, middle school, or special education license. Middle school/junior high licensure in mathematics will be granted when the following criteria are met:

- completion of the following mathematics content courses with a 3.0 minimum GPA, with grade of *C*- or better in 100- and 200-level mathematics content courses and grade of *C* or better in 500- and 600-level mathematics content courses;
- completion of the following professional education courses with a 3.0 minimum GPA, with grade of *C* or better in all professional education courses;
- passing score on Praxis II for Middle School Mathematics; and
- Decision Point Requirements.

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Mathematics content				
MATHS	201	Num Alg Prob	4	
MATHS	202	Dat Geo Meas	3	
MATHS	165	Calculus 1	4	
MATHS	215	Discrete Sys	4	
MATHS	514	Alg Fns Tch	3	
MATHS	542	Geo Meas Tch	3	
MATHS	623	Data Anl Tch	3	
MATHS	631	Tech Mth Tch	3	
Professional education				
MATHS	690	C I Math Ed	3	
EDJHM	512	Instrl Strat	3	
EDJHM	690	Practicum (1–9)	6	
				39 hrs

## MATHEMATICAL SCIENCES (MATHS)

**511 Abstract Algebra 1. (3)** The theory of groups, including subgroups, cyclic groups, normal subgroups, cosets, Lagrange's Theorem, quotient structures, homomorphism, automorphisms, group actions, Sylow's Theorems, structure of finite abelian groups, generators, and relations.

*Prerequisite:* MATHS 311 or permission of the department chairperson.

*Not open to* students who have credit in MATHS 411.

**512 Abstract Algebra 2. (3)** An introduction to the theory of rings, including integral domains, division rings, and fields. Quotient fields of integral domains. Homomorphisms, ideals, and quotient structures. Factorization in commutative rings. Polynomial rings and field extensions. Aspects of Galois theory.

*Prerequisite:* MATHS 411 or 511 or permission of the department chairperson.

*Not open to* students who have credit in MATHS 412.

**514 Algebra and Functions for Elementary and Middle School Teachers. (3)** Algebra as the study of patterns, as a symbolic language, as a tool for problem solving, as the study of functions, as generalized arithmetic, and as a way of modeling physical situations.

*Prerequisite:* at least one year of elementary or middle school teaching experience or permission of the department chairperson.

**516 Theory of Numbers. (3)** Topics include the division algorithm; positional notation; divisibility; primes; congruences; divisibility criteria; the sigma, divisor, and phi functions; Diophantine equations; linear, polynomial, and simultaneous congruences; theorems of Fermat, Euler, Lagrange, and Wilson; quadratic reciprocity.

*Prerequisite:* MATHS 215 or permission of the department chairperson.

*Not open to* students who have credit in MATHS 416.

**517 Number Systems and Number Theory for Elementary and Middle School Teachers. (3)** Number systems, properties and characteristics of classes of numbers, number sense, number theory, operations and their relationships, and algorithms.

*Prerequisite:* at least one year of elementary or middle school teaching experience or permission of the department chairperson.

**522 Theory of Sampling and Surveys. (3)** Survey designs; simple random, stratified, cluster, and systematic sampling; ration estimates; regression estimates; cost and variance functions.

*Prerequisite:* MATHS 321 or the equivalent.

**528 Regression and Time Series Models. (3)** Addresses regression topics that include simple and multiple linear regression, polynomial regression, regression diagnostics, and forecasting. Also introduces time series topics that include exponential smoothing, auto-regressive, integrated, moving average (ARIMA) models, and forecasting.

*Prerequisite:* MATHS 321 or the equivalent.

*Not open to* students who have credit in MATHS 428.

**529 Analysis of Variance in Experimental Design Models. (3)** Multivariate normal distribution; quadratic forms; linear models; simple random, randomized block, Latin squares, factorial, split-plot, balanced incomplete block designs; analysis of covariance; confounding; and multiple comparison tests.

*Prerequisite:* MATHS 321 or equivalent.

*Not open to students who have credit in MATHS 429.*

**542 Geometry and Measurement for Elementary and Middle School Teachers. (3)** Students will develop visualization skills; identify two- and three-dimensional shapes and know their properties; connect geometry to other mathematical topics; research historical topics relevant to elementary and middle school geometry.

*Prerequisite:* at least one year of elementary or middle school teaching experience or permission of the department chairperson.

**551 Mathematics of Finance. (4)** Mathematical theory of compound interest, force of interest, annuities, equations of value, yield rate, amortization, sinking funds, bonds, depreciation, and current topics of finance.

*Prerequisite:* MATHS 166.

*Not open to students who have credit in MATHS 351.*

**552 Mathematics of Life Contingencies 1. (4)** Survival distributions, life tables; the mathematics of life insurance, life annuities, net premiums, and net premium reserves.

*Parallel:* MATHS 551.

*Not open to students who have credit in MATHS 452.*

**553 Mathematics of Life Contingencies 2. (4)** The mathematics of multiple life functions, multiple decrement models, valuation theory for pension plans, insurance models including expenses, nonforfeiture benefits, and dividends.

*Prerequisite:* MATHS 552.

*Not open to students who have credit in MATHS 453.*

**554 Mathematics of Investments. (4)** Mathematical analysis and actuarial principles of investments and asset management.

*Prerequisite:* MATHS 320 (or MATHS 620), 351 (or 551) or permission of the department chairperson.

*Not open to students who have credit in MATHS 454.*

**555 Problems in Actuarial Science. (2)** Limits, continuity, differentiability, integrability, series, sequences, derivatives, integrals, partial derivatives, and multiple integrals; axioms of probability, random variables, conditional probability and Baye's Theorem, joint and conditional probability distributions and expectations; loss frequency, loss severity, retention, deductible, coinsurance, and risk premium.

*Prerequisite:* MATHS 267, 320, 321; RMI 270; or permission of the department chairperson.

*Not open to students who have credit in MATHS 355.*

**556 Introduction to Operations Research. (3)** Optimization techniques of linear programming, dynamic programming, and integer programming. Optimal solutions of PERT-CPM networks. Optimal decision strategies.

*Prerequisite:* MATHS 162 or 166, 217 or permission of the department chairperson.

*Not open to students who have credit in MATHS 456.*

**557 Actuarial Models 1. (4)** Loss and frequency distributions, limited expected value, effects of inflation, parametric and non-parametric models, identification procedures for insurance company data, bootstrapping, Bayesian analysis, compound frequency, methods for censored and truncated data, classical and Bayesian credibility models, experience rating.

*Prerequisite:* MATHS 321 or 620.

*Not open to students who have credit in MATHS 457.*

**558 Actuarial Models 2. (3)** Basic functions related to actuarial models, common parametric models, maximum likelihood estimation for censored or truncated data, nonparametric estimation, hypothesis testing, models with co-variables, simulation, and other topics as time permits.

*Prerequisite:* MATHS 321 or 620.

*Not open to students who have credit in MATHS 458.*

**560 History of Mathematics. (3)** The development of mathematics from pre-history to the seventeenth century. Topics may include number concepts and numeration, algebra, geometry, trigonometry, analytic geometry, and calculus.

*Prerequisite:* MATHS 161 or 165.

*Not open to students who have credit in MATHS 460.*

**562 Numerical Analysis 1. (3)** Topics include error analysis, approximation and interpolation of functions, solutions of nonlinear equations, approximate differentiation and integration, and orthogonal polynomials. Includes programming of numerical algorithms.

*Prerequisite:* CS 120; MATHS 162 or 166.

*Not open to students who have credit in MATHS 362.*

**563 Numerical Analysis 2. (3)** Topics include approximate solution of linear and nonlinear systems of equations by direct and iterative methods, spline interpolation, numerical solution of ordinary and partial differential equations. Includes programming of numerical algorithms.

*Prerequisite:* MATHS 217; MATHS 362 or 562.

**568 Unpaid Professional Experience in Mathematical Sciences. (1–8)** Supervised unpaid work and learning experience as a practicing mathematician, statistician, or actuarial scientist. Practical problem-solving experience will be gained through an internship, practicum, or other such situation.

*Prerequisite:* permission of the department chairperson.

A total of 8 hours of credit may be earned in MATHS 568 and 569 combined.

**569 Paid Professional Experience in Mathematical Sciences. (1–8)** Supervised paid work and learning experience as a practicing mathematician, statistician, or actuarial scientist. Practical problem-solving experience will be gained through an internship, practicum, or other such situation.

*Prerequisite:* permission of the department chairperson.

A total of 8 hours of credit may be earned in MATHS 568 and 569 combined.

**571 Real Analysis 1. (3)** Properties of the real numbers. Cardinality. Topological properties of metric spaces: compactness, completeness, connectedness. Continuous functions. Differential calculus of real- and vector-valued functions of one and several real variables.

*Prerequisite:* MATHS 217, 267, 371, or permission of the department chairperson.

*Not open to students who have credit in MATHS 471.*

**572 Real Analysis 2. (3)** Inverse and implicit function theorems, extremum problems. Infinite series and products. Functions of bounded variation. The Riemann-Stieltjes integral and Fundamental Theorem of Calculus. Sequences of functions. Multiple Riemann integrals.

*Prerequisite:* MATHS 471 or 571.

*Not open to students who have credit in MATHS 472.*

**573 Boundary Value Problems. (3)** Fourier Series and integrals, heat and wave equations in one dimension, Laplace equation in two dimensions, problems in higher dimensions, and numerical methods of solving boundary value problems.

*Prerequisite:* MATHS 374.

*Not open to* students who have credit in MATHS 473.

**575 Topics in Partial Differential Equations. (3)** Classical solution techniques for linear PDEs. Topics include first- and second-order equations, method of characteristics, special functions, orthogonal polynomials, transforms, Green's functions, and fundamental solutions. A computer algebra system is utilized.

*Prerequisite:* MATHS 267, 374, or permission of the department chairperson.

*Not open to* students who have credit in MATHS 475.

**599 Special Studies in Mathematics. (1–8)** Individual work under the direction of a staff member of the department will involve assigned reading and reports and may involve class attendance in related courses.

*Prerequisite:* permission of the department chairperson.

A total of 8 hours of credit may be earned.

**601 Workshop in Mathematics Education. (1–12)** A one- or two-week workshop addressing specific topics in mathematics education.

A total of 12 hours of credit may be earned.

**619 Special Studies in Geometry, Algebra, or Topology. (1–8)** Individual work under the direction of a staff member of the department will involve assigned reading and reports and may involve class attendance in related courses.

*Prerequisite:* permission of the department chairperson.

MATHS 619, 669, and 679, singly or in combination, may be taken for a total of no more than 8 hours of credit.

**620 Mathematical Theory of Statistics 1. (4)** Probability set functions, random variables, density functions, distribution functions, mathematical expectations, moment generating functions, Chebyshev's inequality, marginal and conditional distributions, some special distributions, distributions of functions of random variables, limiting distributions, sampling distributions, Central Limit Theorem.

*Prerequisite:* MATHS 166.

**621 Mathematical Theory of Statistics 2. (4)** Classical and Bayesian estimation, sufficiency, completeness, uniqueness, likelihood function, exponential families, Rao-Blackwell theorem, Rao-Cramer inequality, hypothesis testing, Neyman-Pearson lemma likelihood ratio tests, goodness-of-fit, contingency tables, nonparametric tests, distribution of quadratic forms, correlation, and regression.

*Prerequisite:* MATHS 620.

**623 Data Analysis and Probability for Teachers. (3)** Students will select and use appropriate statistical methods to analyze data, develop, and evaluate inferences and predictions that are based on data, and understand and apply the basic concepts of probability.

*Prerequisite:* at least one year of teaching experience or permission of the department chairperson.

**625 Probability Theory and Applications. (3)** Basic probability theory, random variables, conditional probability and conditional expectation, Poisson process, interarrival time, and waiting time distributions.

*Prerequisite:* MATHS 166 or equivalent.

**626 Probability and Stochastic Processes. (3)** Discrete and continuous time Markov chains, queuing theory, renewal theory.

*Prerequisite:* MATHS 625.

**627 Generalized Linear Models with Applications. (4)** Methods needed to analyze non-normal data. Topics include exponential family of distributions, an overview of generalized linear models. Models for: continuous data with constant variance, binary data, polytomous data, count data, time to events or survival data.

*Prerequisite:* MATHS 217, 321 or 620.

**628 Monte Carlo Methods. (4)** The theory of Monte Carlo methods and their applications in scientific computing. Study of pseudorandom number generation, statistical tests for randomness, generation of nonuniform random variables, and variance reduction techniques. Selected applications from numerical integration, computational finance, and linear algebra. Low-discrepancy sequences and hybrid-Monte Carlo methods.

*Prerequisite:* MATHS 625.

**631 Technology for Mathematics Teachers. (3)** Modeling, computational, and communication tools used in teaching mathematics.

*Prerequisite:* at least one year of teaching experience or permission of the department chairperson.

**632 Assessment in Mathematics Education. (3)** Issues related to assessment in mathematics education and the relationship of assessment to curriculum and instruction. Examination of various types of assessments administered in mathematics classrooms, as well as large-scale local, national, and international assessments.

*Prerequisite:* at least one year of teaching experience or permission of the department chairperson.

**641 Topics in Geometry. (3)** A survey of topics in contemporary geometry from various perspectives, including conjecture and exploration, formal analysis, and application beyond geometry.

*Prerequisite:* MATHS 345 or the equivalent.

**645 Topology 1. (3)** Set theoretic preliminaries, the axiom of choice, Zorn's lemma and the well-ordering principle, topological spaces, continuity, separation axioms, nets and filters, connectedness, local connectedness, product and quotient topologies, metric spaces, metrization.

*Prerequisite:* MATHS 472 or 572.

**646 Topology 2. (3)** Uniform spaces, paracompactness, open coverings, compactness, compactification, local compactness, function spaces, Stone-Weierstrass theorem, complete spaces, Banach fixed-point theorem, introductory homotopy theory. Introduction to homology theory, Jordan curve theorem, Brouwer fixed-point theorem.

*Prerequisite:* MATHS 645.

**655 Topics in Actuarial Science. (4)** Advanced actuarial principles in the fields of investments and asset management. Topics include capital markets, investment vehicles, derivatives-applications, principles of portfolio management, asset-liability management, design and valuation for the various actuarial models.

*Prerequisite:* MATHS 551.

**658 Risk Theory. (4)** Individual and collective risk theory. Probability of ruin. Probability distributions of random numbers of random variables.

*Prerequisite:* MATHS 552.

**659 Research in Actuarial Science. (3)** Research study in actuarial subjects of current interest in life, property/casualty, health, and/or pension. Literature searches on selected topics. Articles from research journals will be read and discussed. Will use actuarial skills from several courses. A paper will be required.

*Prerequisite:* MATHS 552.

**660 Topics in the History of Mathematics. (3)** In-depth study of selected topics in the history of mathematics.

*Prerequisite:* MATHS 162 or 165, 460 or 560.

**669 Special Studies in Applied Mathematics. (1–8)** Individual work under the direction of a staff member of the Department of Mathematical Sciences will involve assigned reading and reports and may involve class attendance in related courses.

MATHS 619, 669, and 679, singly or in combination, may be taken for a total of no more than 8 hours of credit.

**670 Elements of Analysis. (3)** An introduction to elementary point-set topology; development of the limit concept related to sequences and functions; introduction to the development of real numbers through Cauchy sequences; applications of the limit concept in continuity, derivatives and integrals of elementary functions.

*Prerequisite:* MATHS 166.

**671 Continuous and Discrete Mathematics for Elementary and Middle School Teachers. (3)** Fundamental concepts of calculus and discrete mathematics.

*Prerequisite:* MATHS 512, 542 or permission of the department chairperson.

**675 Theory of Functions of Real Variables 1. (3)** The concept of measurability, simple functions, properties of measures, integration of positive as well as complex functions, sets of measure zero, Riesz representation theorem, Borel and Lebesgue measures, LP-spaces, Elementary Hilbert Space theory.

*Prerequisite:* MATHS 472 or 572.

**676 Theory of Functions of Real Variables 2. (3)** Banach spaces, Baire's theorem. Hahn-Banach theorem, complex measures, total variation, absolute continuity, Radon-Nikodym theorem, bounded linear functionals on LP, the Riesz representation theorem, product measures, the Fubini theorem, completion of product measures.

*Prerequisite:* MATHS 675.

**677 Complex Variables 1. (3)** Complex number systems, differentiation and integration, functions (analytic, entire, meromorphic) of one complex variable, singularities, complex integration, Cauchy's theorem, Cauchy's integral formula, power series, Laurent series, calculus of residues.

*Prerequisite:* MATHS 472 or 572.

**678 Complex Variables 2. (3)** Analytic continuation, Riemann surfaces, theorems of Weierstrass and Mittag-Leffler, solution of two-dimensional potential problem, conformal mapping, Schwartz-Christoffel transformations and their applications.

*Prerequisite:* MATHS 677.

**679 Special Studies in Analysis. (1–8)** Individual work under the direction of a staff member of the Department of Mathematical Sciences will involve assigned reading and reports and may involve class attendance in related courses.

MATHS 619, 669, and 679, singly or in combination, may be taken for a total of no more than 8 hours of credit.

**680 Special Studies in the Teaching of Mathematics. (1–6)** The student will work under the direction of a staff member in the Department of Mathematical Sciences. Assigned reading and reports; possible class attendance in related courses.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.

**689 Research Methods in Mathematics and Statistics. (3)** The scientific method in mathematical research. Location of relevant journal articles, reference books, and reviews. Development of research and problem-solving techniques. Each student will write a mathematical paper. The instructor will assist students whose work is of exceptional quality in submitting their results for publication.

**690 Curriculum and Instruction in Mathematics Education. (3)** Focuses on the mathematics curriculum, with emphasis on current issues and trends, on teaching strategies, and standards-based teaching. Looking at mathematics curriculum from a K–12 perspective, we will work on understanding these recommendations in light of previous mathematics curriculum experiences.

*Prerequisite:* at least one year of teaching experience or permission of the department chairperson.

**691 Developmental Instruction in Mathematics. (3)** Materials and methods used in developing conceptual understanding of mathematics for all students in elementary school, middle school, high school, and community college. Includes assessment and remediation techniques.

*Prerequisite:* at least one year of teaching experience or permission of the department chairperson.

**693 Problem-Solving and Communication in Mathematics. (3)** Knowledge and skills for teaching and learning mathematics through problem solving. Knowledge and skills for orchestrating oral and written communication to promote mathematical reasoning in student-centered mathematics classrooms.

*Prerequisite:* at least one year of teaching experience or permission of the department chairperson.

**694 Research Methods in Mathematics Education. (3)** Research analysis and methodology in mathematics education.

*Prerequisite:* at least one year of teaching experience and 9 hours of graduate credit in mathematics or mathematics education.

**695 Learning Theories in Mathematics Education. (3)** In-depth study of learning theories; discussion of the psychology of mathematics learning (i.e., what we know about the ways in which students learn mathematics). These issues will be discussed from a “teacher’s perspective,” looking for classroom implications of our knowledge about children’s mathematical thinking.

*Prerequisite:* at least one year of teaching experience or permission of the department chairperson.

**696 Action Research in Mathematics Education. (3)** Teachers design and conduct action research projects in their own mathematics classrooms and present their findings in oral and written reports.

*Prerequisite:* MATHS 694 or permission of the department chairperson.

**697 Teacher Leadership in Mathematics Education. (3)** Development of strategies and skills for teacher leadership in mathematics education, with a focus on models for professional development of mathematics teachers.

*Prerequisite:* MATHS 690; permission of the department chairperson.

**699 Seminar in Mathematics. (1–6)** For students who wish to pursue some particular problem or group of problems in mathematics. Assigned readings and conferences.

A total of 6 hours of credit may be earned.

## CENTER FOR MEDICAL EDUCATION

[www.bsu.edu/mcme](http://www.bsu.edu/mcme)

Maria Bingham Hall 207, 765-285-1051

Director: T. Stuart Walker

Graduate Faculty: Pederson

### ANATOMY (ANAT)

**601 Human Gross Anatomy. (8)** A strong background in basic morphologic and functional relations. Emphasizes regional anatomy. Four two-and-one-half hour laboratory periods weekly.

*Prerequisite:* admission to the medical education program.

**606 Medical Neuroanatomy. (4)** Normal structural and functional organization of the human central nervous system as a background for the interpretation of its dysfunction. Assumes prior knowledge of human peripheral nervous system and effector mechanisms. Two-and-one-half hour lecture plus four hours of laboratory weekly.

*Prerequisite:* ANAT 601.

**631 Medical Histology-Embryology. (5)** Normal and abnormal developmental processes related to the differentiation of tissues and organs; microscopic study of organs and tissues as background for physiological and pathological consideration.

*Prerequisite:* admission to the medical education program.

### BIOLOGY (BIO)

**642 Medical Microbiology. (8)** Microbiology for medical students with consideration of bacteria, fungi, viruses, and parasites as agents in human disease and the immunological and serological aspects of the host-parasite relationship.

*Open only to* medical students or by permission of the department chairperson.

**653 Medical Genetics. (2)** Genetics for medical students: basic genetic principles, human cytogenetics, molecular genetics, genetic epidemiology, probability, population and quantitative (multifactorial) genetics, dermatoglyphics, etiology of birth defects, inborn metabolic disorders, genetic screening and counseling, genetics of mental illness and cancer, pharmacogenetics, immunogenetics, and genetic engineering.

*Prerequisite: Open only to* medical students or by permission of the department chairperson.

### CHEMISTRY (CHEM)

**667 Medical Biochemistry. (6)** Chemistry of major cellular constituents; enzymes as the catalysts of intracellular chemical reactions with emphasis on underlying principles of physical and organic chemistry. Intermediary metabolism of carbohydrates, lipids, amino acids, and nucleotides; modern techniques employed in the study of metabolic processes; biosynthesis and degradation of intracellular components; hormonal regulation of metabolism.

*Prerequisite:* admission to the medical education program.

### PHYSIOLOGY (PHYSL)

**640 Medical Physiology. (8)** Summary of human physiology for medical students. Cellular and organ-system physiology; physiological regulation. Laboratory exercises will demonstrate general principles of physiology and introduce basic techniques and instrumentation.

*Prerequisite:* admission to the medical education program.

**645 Emergency Medicine. (2)** Designed to develop an awareness of proper diagnosis and treatment during emergency medical care by professional medical personnel. Fractures; environmental emergencies; injuries to the eye, chest, abdomen; shock; and wound care.

*Prerequisite:* admission to the medical education program.

## MODERN LANGUAGES AND CLASSICS

[www.bsu.edu/languages](http://www.bsu.edu/languages)

North Quadrangle 138, 765-285-1361

*Chairperson:* Christopher Luke

*Graduate Faculty:* L. Barnette, W. Barnette, Colvin, Fritz, Gauggel, Gilman, Guntsche, Johnson, Koehler, Luke, Magrath, Pak, Ruebel, Shea, Stegman, Thorington, Tomizawa, Wycislo, Zheng

### CLASSICAL CULTURE (CC)

**598 Reading Course. (3–9)** An arranged course in selected readings.

*Prerequisite:* permission of the department chairperson.

A total of 9 hours of credit may be earned.

### FOREIGN LANGUAGES (FL)

**590 Independent Study. (1–9)** Topics to be chosen and investigated in consultation with a specific instructor.

A total of 9 hours of credit may be earned.

**595 Methods and Materials for Teaching Foreign Language. (3)** Current methods in foreign language teaching in the senior high school. Presentation, texts, teaching materials, CAI, and other supplementary aids. Reviews current professional literature, trends, and requirements.

*Prerequisite:* two years of college credit or the equivalent in a modern language and intention to pursue a teaching curriculum.

*Prerequisite recommended:* EDSEC 380.

**596 Technology and Assessment in Foreign Language. (3)** Current theory and practice of technology and assessment in the foreign language classroom. Evaluation of resources, preparation of instructional materials and instruments, articulation and integration of technology and assessment into curricula and lesson plans. Audio, video, and computer-based technologies. Assessment of oral, aural, writing, reading, and culture.

*Prerequisite recommended:* FL 595.

*Open only to* education majors or minors.

**599 Research Seminar. (3)** Introduction to research in foreign languages and literature. Survey, discussion, evaluation, and application of research techniques in literary study, methodology, bibliography, and practical criticism.

**FRENCH (FR)**

**500 French Study Abroad. (3–9)** Study of advanced French language, literature, and culture in a country where French is the native language. May include seminars arranged during travel.

A total of 9 hours of credit may be earned.

**501 Advanced Conversation. (3–6)** Advanced practice in oral French to increase fluency and authenticity through discussion and debate.

A total of 6 hours of credit may be earned in combination with FR 301.

**502 Composition and Stylistics. (3–6)** Advanced practice in original composition with emphasis on style and stylistics.

A total of 6 hours of credit may be earned in combination with FR 302 or 303.

**503 Advanced Grammar. (3)** Advanced, in-depth study of French grammar with work in French–English translation.

**534 Contemporary France. (3)** Present-day France and French institutions viewed in the context of French perceptions of the family, education, politics, the judicial system, the economy, and religion. Supplementary readings in current newspapers and periodicals.

*Prerequisite:* FR 201, 202.

*Not open to* students who have credit in FR 404.

**538 Business French. (3)** Designed to make the advanced French student familiar with commercial forms and terminology used in business, banking, and industry.

*Not open to* students who have credit in FR 338.

**550 Workshop in Contemporary Francophone Issues. (3–6)** For inservice teachers who want to increase their proficiency in speaking and hearing the French language and their understanding of issues in present-day France and French-speaking countries.

*Prerequisite:* at least one year's teaching experience.

A total of 6 hours of credit may be earned.

**598 Readings. (3–9)** Individualized reading or research to allow students to explore special topics with a specific instructor. Designed to meet the needs of graduate students who have special projects in French.

A total of 9 hours of credit may be earned.

**599 Bibliography and Readings. (3)** Major works, primary and secondary sources in French language, literature, culture, and teaching.

*Prerequisite:* 15 hours of graduate credit in French and permission of the department chairperson.

**GERMAN (GER)**

**500 German Study Abroad. (3–9)** Study of advanced German language, literature, and culture in a country where German is spoken as a native language. May include seminars arranged during travel.

A total of 9 hours of credit may be earned.

**501 Advanced Conversation. (3–6)** Advanced practice in oral German to increase fluency and authenticity in the language.

A total of 6 hours of credit may be earned.

**502 Composition and Stylistics. (3–6)** Advanced practice in written German with emphasis on style and stylistics.

A total of 6 hours of credit may be earned.

**550 Workshop in Contemporary German Issues. (3–6)** For inservice teachers who want to increase their proficiency in speaking and hearing the German language and their understanding of issues in present-day Germany and German-speaking countries.

*Prerequisite:* at least one year of teaching experience.

A total of 6 hours of credit may be earned.

**598 Readings. (3–9)** Individualized reading or research to allow students to explore special topics with a specific instructor. Designed to meet the needs of graduate students who have special projects in German.

A total of 9 hours of credit may be earned.

## GREEK (GRK)

**598 Readings. (1-9)** Individualized readings or research to allow students to explore special topics with an individual instructor. Designed to meet the needs of graduate students who have special projects in Greek.

*Prerequisite:* permission of the instructor.

A total of 9 hours of credit may be earned.

## JAPANESE (JAPAN)

**598 Readings. (1-9)** Individualized readings or research to allow students to explore special topics with an individual instructor. Designed to meet the needs of graduate students who have special projects in Japanese.

*Prerequisite:* permission of the instructor.

A total of 9 hours of credit may be earned.

## LATIN (LAT)

**501 Didactic Poetry. (3)** Selected readings from Lucretius, Vergil's *Georgics*, or Ovid's *Ars Amatoria*.

**502 Advanced Prose Composition. (3–6)** A detailed grammar review, analysis of Latin prose style, composition of extended passages in Latin.

A total of 6 hours of credit may be earned.

**507 Cicero. (3)** Selected readings from Cicero's rhetorical and philosophical works.

**508 Republican Historiography. (3)** Selected readings from Caesar, Sallust, Nepos.

**509 Imperial Historiography. (3)** Selected readings from Livy, Tacitus, Suetonius.

**510 Roman Drama. (3)** Selected readings from Plautus, Terence, or Seneca.

**512 Lyric Poetry. (3)** Selected readings from Catullus or Horace's odes and epodes.

**513 Elegiac Poetry. (3)** Selected readings from the elegiac poems of Tibullus, Propertius, and Ovid.

*Not open to* students who have credit in LAT 304.

**514 Vergil: *Aeneid*. (3)** Selected readings.

515 Satire. (3) Selected readings from Horace, Persius, Martial, Juvenal.

**516 Silver Latin Epic. (3)** Selected readings from Ovid's *Metamorphoses*, Lucan, or Statius.  
*Not open to students who have credit in LAT 301.*

**522 Silver Latin Prose. (3–6)** Selected readings from Petronius, Seneca the Younger, Quintilian, Pliny the Younger, Apuleius.

A total of 6 hours of credit may be earned.

**525 Workshop for Teachers. (3)** For inservice teachers wishing to improve their personal proficiency and update teaching methods and techniques.

*Prerequisite:* at least one year of teaching experience.

598 Readings. (3–9) Individualized readings or research allows students to explore special topics with a specific instructor.

A total of 9 hours of credit may be earned.

## SPANISH (SP)

**500 Spanish Study Abroad. (3–9)** Study of advanced Spanish language, literature, and culture in a country where Spanish is the native language. May include seminars arranged during travel.

A total of 9 hours of credit may be earned.

**501 Advanced Conversation. (3–6)** Advanced practice in oral Spanish to increase fluency and authenticity through activities, discussion, and debate.

A total of 6 hours of credit may be earned.

**502 Composition and Stylistics. (3–6)** Advanced practice in original composition with emphasis on style and stylistics.

A total of 6 hours of credit may be earned.

**503 Advanced Grammar. (3)** Advanced, in-depth study of Spanish grammar with emphasis on analysis and creative expression in the language.

**511 Spanish Literature from the Seventeenth through the Nineteenth Century. (3)** The history of Spanish literature from the latter part of the Golden Age through late Romanticism. Representative works and authors.

**512 Latin American Literature through the Nineteenth Century. (3)** Major works of Spanish American literature from the chronicles to modernism.

**519 Twentieth-Century Spanish Literature. (3)** Acquaints students with the major literary works (in all genres) reflecting changing currents in Spanish life and thought during this century. Readings will include works of the Generation of '98, the Generation of '27, and post-Civil War works.

**534 Contemporary Spain. (3)** Present-day Spain and Spanish institutions viewed in the light of Spanish perceptions. Topics vary according to changing conditions and problems.

*Not open to students who have credit in SP 334.*

**535 Contemporary Latin America. (3)** Elements of present-day problems and conditions in various countries or areas of Latin America. Topics vary according to changing conditions and problems.

*Not open to students who have credit in SP 335.*

**537 Special Language Skills. (3–9)** Topics vary and will be announced. Topics may be, among others, advanced study in phonetics, composition, linguistics, Spanish–English translation, or Spanish for the professions.

A total of 9 hours of credit may be earned.

*Not open to students who have credit in SP 337.*

**538 Business Spanish. (3)** Designed to make advanced Spanish students familiar with commercial forms and terminology used in business, banking, and industry.

*Not open to students who have credit in SP 338.*

**548 Twentieth-Century Latin American Literature. (3)** Main trends in Spanish American literature (in all genres) since modernism. Includes modernism, realism, post-modernism, and recent literary trends.

**550 Workshop on Contemporary Issues. (3–6)** For inservice teachers wishing to improve their proficiency in contemporary Spanish usage.

*Prerequisite:* at least one year's teaching experience.

A total of 6 hours of credit may be earned.

**598 Readings. (3–9)** Individualized reading or research to allow students to explore special topics with a specific instructor. Designed to meet the needs of graduate students who have special projects in Spanish.

A total of 9 hours of credit may be earned.

**599 Bibliography and Readings. (3)** Major works, primary and secondary sources in Hispanic language, literature, culture, and teaching.

*Prerequisite:* 15 hours of graduate credit in Spanish.

## NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT

[www.bsu.edu/nrem](http://www.bsu.edu/nrem)

West Quadrangle 110, 765-285-5780

*Chairperson:* James Eflin

*Graduate Advisor:* James Eflin

*Graduate Faculty:* Chandler, Eflin, Gregg, Pichtel, Popovicova

### PROGRAMS

Master of arts (MA) in natural resources and environmental management and master of science (MS) in natural resources and environmental management.

See the Science listing under the College of Sciences and Humanities, page 160, for the doctoral programs in science education and philosophy in science. Specializations within the program include: environmental management, environmental education and communication, international resource management, land management, occupational and industrial hygiene, park and recreation management, and sustainable development.

### Admission

Applicants must meet the admission requirements of the Graduate School, take the Graduate Record Examination (GRE), complete the departmental application form, and provide letters of recommendation. Applicants whose undergraduate majors are not natural resources or closely related subjects may be required to complete undergraduate courses to acquire background knowledge. Credit for these courses does not apply to graduate degree requirements.

## MASTER OF ARTS IN NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Required courses				
NREM	608	Resch Method	3	
NREM	609	Seminar	3	
RES	697	Research Ppr (1-3)	3	
Electives include other NREM courses and relevant courses from other departments to be approved by the graduate advisor				24
				33 hrs

## MASTER OF SCIENCE IN NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT

### Degree Requirements

Prefix	Number	Short Title	Course Credit Hrs	Program Required
Required Courses				
NREM	608	Resch Method	3	
NREM	609	Seminar	3	
THES	698	Thesis (1-6)	6	
Electives include other NREM courses and relevant courses from other departments to be approved by the graduate advisor				21
				33 hrs

### Facilities and Special Programs

Facilities consist of teaching and research laboratories, lecture and discussion class-rooms, a computer lab, a darkroom, a student reading room, and a seminar-conference room. All classrooms and laboratories are accessible to students with disabilities.

University-owned properties—the Hults Environmental Learning Center, Christy Woods, Ball State Wildlife Preserve, and Ginn-Nixon Woods—near the Ball State campus serve as field laboratories for teaching and research. The city of Muncie and surrounding areas offer first-hand study of environmental issues such as air, water, and soil quality, energy issues, land-use planning, and recreational management.

Research equipment includes state-of-the-art instrumentation for analysis of a variety of contaminants of air, water, and land.

Each summer the department sponsors field courses in which students travel to diverse locations for study. Past field courses have studied resource management in the American West, the Great Lakes states, the Appalachians, Central America, and Europe.

In addition to off-campus field courses, the department offers practicum opportunities with federal, state, and private agencies in various facets of resource management.

## **NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT (NREM)**

**502 Field Study. (1–6)** Off-campus field studies of a specific geographic area with emphasis on resource management. Details of arrangements (including group travel plans and housing) will be provided by the instructor.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.

**503 Environmental Economics. (3)** The application of economic principles to environmental problems. Emphasizes applying the economist's decision-making model to environmental issues and the advantages and shortcomings of the economist's analysis.

*Prerequisite:* ECON 201 or 509 and 3 hours of credit in natural resources, preferably NREM 101, or permission of the department chairperson.

*Not open to* students who have credit in ECON 311, 511, or NREM 303.

**504 Sustainable Agriculture. (3)** Natural resource use in agricultural systems with emphasis on principles of sustainability. Includes integrated pest management, permaculture, and other production practices that conserve soil, water, and biological resources. Field trips included.

*Not open to* students who have credit in NREM 304.

**505 Integrated Resource Management. (3)** Systems perspective on holistic or integrated planning and management of natural resources. Stresses data analysis and its role in the decision-making process.

*Prerequisite:* permission of the department chairperson.

*Not open to* students who have credit in NREM 405.

**507 Environmental Management in Developing Countries. (3)** Survey of challenges facing management of urban environments and the rural-urban interface in the developing nations of Asia, Africa, Latin America, and Pacific Oceania. Features interdisciplinary approach with frequent guest speakers to discuss existing and potential management, economic, technical, and policy solutions in their regional, cultural, and historical contexts.

*Not open to* students who have credit in NREM 307.

**509 Sociopolitical Dimensions of Global Environmental Change. (3)** Systematic exploration of major topics of human and environmental change from local to global scales, including population, energy, agriculture, industry, technology, urbanization, water, climate, natural hazards, socio-economic systems, land use, trade, marginalized societies, and biodiversity.

*Not open to* students who have credit in NREM 309.

**511 Water Resources. (3)** Hydrologic cycle and climate as a basis for water resources distribution and management. U.S. and international water resources issues: U.S. water allocation laws, national and international water conflicts, water quality, drinking water and wastewater treatment, surface and ground water hydrology, municipal water resources development. Includes laboratory and field work and a graduate-level research project.

**515 Water Quality Management. (3)** Drinking and surface water issues: point and non-point sources of pollution, regulated and unregulated contaminants and their management, drinking water treatment and regulation. Role of Safe Drinking Water and Clean Water Acts in water quality management. Laboratory and field work includes sampling and analysis of various water quality parameters.

*Prerequisite:* CHEM 111 or the equivalent; or permission of the department chairperson.

*Not open to* students who have credit in NREM 315.

**520 Wetland Characterization. (3)** Study of wetland functions and values. Delineation of wetland boundaries according to the U.S. Army Corps of Engineers criteria (wetland hydrology, hydric soils, hydrophytic vegetation). Includes a substantial component of field work.

*Prerequisite:* permission of the department chairperson.

**521 Soil Resources. (3)** The basic properties of the soil portion of the ecosystem. Prime emphasis on the genesis and resulting chemical and physical characteristics of soils. Includes a graduate-level research project.

*Prerequisite:* CHEM 112, or the equivalent; or permission of the department chairperson.

**522 Soil Quality. (3)** Chemical, physical, and biological properties of soil that affect plant production and other land uses. Emphasizes nutrient cycles in natural and cropped systems. Use and fate of pesticides. Land application of agricultural and urban wastes.

*Prerequisite:* CHEM 111 or equivalent; or permission of the department chairperson.

*Not open to* students who have credit in NREM 322.

**524 Soil Classification and Interpretation. (3)** Soil genesis, morphology, classification, and survey. The relationship between soils information and land use; practical application in the decision-making process. Emphasizes field study of soils and their uses.

*Not open to* students who have credit in NREM 324.

**527 Soil Conservation and Management. (3)** Principles and methods of controlling soil erosion, stressing use of basic soil concepts. Management systems and individual practices, with special emphasis on soil resource maintenance.

*Not open to* students who have credit in NREM 327.

**531 Energy and Mineral Resources: Issues and Choices. (3)** Appraisal of the problems, prospects, and societal and technical issues surrounding the use of energy and mineral resources. Emphasizes environmental problems and ecoenergetics, consideration of the natural resource base, distribution and production problems, conservation, alter-native energy systems, resource policy, and research.

*Not open to* students who have credit in NREM 331.

**535 Renewable Energy and Sustainable Technology. (3)** Exploration of alternative/ renewable energy systems (wind, solar, hydro, biomass, geothermal, fuel cells). Case studies of sustainable technology emphasize topics including industrial ecology (life-cycle analysis, design for the environment, clean manufacturing, and impact assessment) and appropriate technology applications in developing countries. Problem-solving applications using various approaches.

*Not open to* students who have credit in NREM 335.

**541 Air Quality. (3)** Focuses on the contamination of the atmospheric environment. Topics include major contaminants; measurement techniques; dispersion; effects on the atmosphere, human health, vegetation, and materials; regulatory requirements and practices; control measures; noise pollution. Lab and field experiences.

*Not open to students who have credit in NREM 341.*

**546 Indoor Environmental Quality. (3)** Focuses on problems in residential and nonresidential indoor environments; contaminants; health effects; sick buildings; diagnosis and measurement; mitigation measures. Lab and field experiences.

*Not open to students who have credit in NREM 346.*

**547 Occupational/Industrial Hygiene. (3)** Introduces the principles of assessing and controlling exposures to workplace hazards. Topics include occupational disease; exposure to contaminant gases, dusts, radiation, noise, and biological agents; ergonomic concerns; regulatory requirements; engineering control and personal protection equipment.

*Not open to students who have credit in NREM 347.*

**548 Asbestos and Lead Management. (3)** Principles and practices associated with conducting asbestos and lead inspections and exposure hazard assessments. Discussion of use, health effects, assessment methods, and regulatory requirements. State certifications available on successful completion. Field and hands-on experiences.

*Not open to students who have credit in NREM 348.*

**550 Hazardous Materials Health and Safety. (3)** Worker health and safety principles and practices in handling hazardous materials, waste remediation, and emergency responses to accidental chemical releases and terrorist episodes.

*Not open to students who have credit in NREM 350.*

**553 Turfgrass Management. (3)** Maintenance of turfgrass lawns, golf courses, athletic fields, playgrounds, parks, and roadsides. Practical management recommendations including regional adaptation of grasses, soils, fertilization, general maintenance practices, diseases, and insect control. Stresses the identification of grass and weed species.

**557 International Rural Development. (3)** Analysis of rural development in Asia, Africa, and Latin America. Emphasizes the roles of population, agriculture, history, conflict, technology, international debt, multi-lateral organizations, and political and cultural traditions in development efforts. Interdisciplinary readings and case studies.

*Not open to students who have credit in NREM 357.*

**571 Outdoor Recreation and Society. (3)** The role of outdoor recreation in modern society. Perspectives ranging from local to global. Examination of the history of growth in outdoor recreation in the United States to the present day, emphasizing issues in both public and private sectors. May require one weekend field trip in addition to regular laboratory periods.

*Not open to students who have credit in NREM 371.*

**572 Applied Research Methods in Resource Management. (3)** Designed to train students in social science applications in natural resource and environmental management. These applications include quantitative and qualitative survey research designs, analysis of social data, and applications of survey results to political processes. Perspectives range from local to international.

*Not open to students who have credit in NREM 372.*

**573 Outdoor Recreation Planning and Administration. (3)** Application of basic principles and procedures for the planning and administration of resource-based and activity-based recreation areas. May require one weekend field trip as well as in-class field trips.

*Prerequisite: NREM 371 or 571 or permission of the department chairperson.*

*Not open to students who have credit in NREM 473.*

**577 Wilderness and Society. (3)** Defining wilderness, understanding its unique significance, and analyzing techniques of past and present management. Includes study of research in perception and use. Weekend trip to the Deam Wilderness—Hoosier National Forest or a state forest back-country area.

*Not open to students who have credit in NREM 477.*

**581 Site Remediation Technologies. (3)** Engineering principles applied to selected environmental problems. Underground storage tank closure and removal; environmental site assessments; remediation of severely disturbed environments; site safety issues. Some environmental chemistry.

*Prerequisite:* NREM 221 or 521; CHEM 111, 112; or permission of the department chairperson.

*Not open to students who have credit in NREM 481.*

**585 Wastewater Management. (3)** Effects of wastewater on receiving waters, need for wastewater treatment, principles of wastewater treatment technologies: onsite, centralized, conventional and alternative treatment technologies; management and regulatory strategies. Includes field trip(s).

*Not open to students who have credit in NREM 385.*

**586 Computer Applications in Environmental Management. (3)** Use of computer software applications for data analysis and management of natural and human-controlled environments. Work with word processors, spreadsheets, statistical analysis packages, presentation graphics, Web browsers/editors, and computer simulation models. Requires basic understanding of computer operation.

*Prerequisite:* permission of the department chairperson.

*Not open to students who have credit in NREM 286.*

*Open only to NREM majors.*

**587 Solid and Hazardous Waste Management. (3)** Delineation of solid and hazardous waste management in the United States. Waste reduction, recycling, processing, and disposal methods are discussed. Technical, political, and economic aspects of waste management. Effects of improper disposal on environmental quality.

*Not open to students who have credit in NREM 387.*

**588 Environmental Assessment and Analysis. (3)** Experience with Phase I and Phase II environmental site assessments. Review of relevant U.S. environmental regulations. Substantial environmental chemistry.

*Prerequisite:* CHEM 231 or equivalent; or permission of the department chairperson.

*Not open to students who have credit in NREM 488.*

**589 Emergency Response to Biological, Chemical, and Nuclear Hazards. (3)** The mode of action of biological, chemical, and nuclear agents, their toxicological effects and treatment. Emergency response to domestic incidents. Incident Command Systems. Selection and proper use of respirators and chemically-protective clothing. Decontamination principles.

*Not open to students who have credit in NREM 389.*

**592 Environmental Interpretation. (3)** Develops skills and techniques necessary to the interpretation of ecological and environmental characteristics of earth systems. Emphasizes field work and creative presentation of concepts, and organization and management of interpretive programs including sites and facilities.

*Not open to students who have credit in NREM 392.*

**595 Teaching Environmental Education. (3)** Opportunities for enriching instruction through environmental education in formal and nonformal educational settings. Studies conservation, outdoor and environmental education, including teaching techniques and instructional resources used in each.

*Not open to students who have credit in NREM 395.*

**597 Special Studies in Environmental and Natural Resource Sciences. (1–3)** Special academic study opportunities in the environmental and natural resource sciences.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

**608 Research Methodologies in Natural Resources and Environmental Sciences. (3)** Development of concepts and skills for those preparing for graduate research in natural resources and environmental sciences. Introduction to research designs, data-gathering techniques, data analysis, and research planning. Emphasizes interpreting published research and the drafting of a concise research proposal.

**609 Seminar. (3)** Presentations of graduate student research or program projects. Discussion and critical examination of resource/environmental topics. Assessment of scientific inquiry by data analysis and interpretation.

*Prerequisite:* NREM 608 or permission of the department chairperson.

**669 Advanced Professional Practice. (1–3)** Advanced supervised professional learning experiences in environmental/natural resource management, studies, or education.

*Prerequisite:* permission of the department chairperson.

A total of 3 hours of credit may be earned.

**697 Advanced Topics in Environmental and Natural Resource Management. (1–3)** Advanced special topics course in environmental and natural resources management.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned, but no more than 3 in any one semester or term.

## **EMERGENCY MANAGEMENT AND HOMELAND SECURITY (EMHS)**

**593 Special Topics. (1-6)** Provides an opportunity to conduct independent study of emergency management and homeland security topics of special interest to students.

*Prerequisite:* permission of the department chairperson.

A total of 6 hours of credit may be earned.