

# DEPARTMENT OF NATURAL RESOURCES AND EARTH SCIENCES

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The Department of Natural Resources and Earth Sciences offers an active learning curriculum which engages students through classroom activities and a structured external undergraduate research program. By integrating the theoretical and applied sciences, we seek to prepare students for careers or advanced studies in management, conservation, protection, regulation, and restoration of natural resources; and the development of strategies for a sustainable future.

Geology focuses students' attention on the earth's composition, internal structure, processes, and history. Geologists are vital for supplying society with energy resources, building materials and water; protecting and remediating underground contamination of water and soil; and minimizing the impact of geologic hazards such as floods, landslides, and earthquakes.

Environmental Science merges concepts in geology, ecology, biology, chemistry and physics to provide students with a strong science foundation which forms the basis for understanding complex environmental issues. Integration of the human dimensions of resource use with conservation and management forms the foundation of the Natural Resources and Recreation Management program. The Specialty Agriculture program provides educational opportunities in agriculture, agribusiness, and agrotourism, covering both traditional and sustainable agricultural sciences.

All programs incorporate technology such as geographic information systems, remote sensing, and discipline specific instrumentation to provide students with state-of-the-art educational experiences, so they move confidently on to future endeavors. Additionally, all programs integrate understanding of laws and regulations relevant to aspects of conservation, protection, and management of natural resources preparing students for decision making in our modern world.

## Programs

- Environmental Science, B.S. (<http://catalog.marshall.edu/undergraduate/programs-az/science/natural-resources-environment/environmental-science-bs/>)
- Environmental Science, Minor (<http://catalog.marshall.edu/undergraduate/programs-az/science/natural-resources-environment/environmental-science-minor/>)
- Geology, B.A. (<http://catalog.marshall.edu/undergraduate/programs-az/science/geology/geology-ba/>)
- Geology, B.S. (<http://catalog.marshall.edu/undergraduate/programs-az/science/geology/geology-bs/>)
- Geology, Minor (<http://catalog.marshall.edu/undergraduate/programs-az/science/geology/geology-minor/>)
- Natural Resources and Recreation Management, B.S. (<http://catalog.marshall.edu/undergraduate/programs-az/science/natural-resources-environment/natural-resources-recreation-management-bs/>)

- Natural Resources and Recreation Management, Minor (<http://catalog.marshall.edu/undergraduate/programs-az/science/natural-resources-environment/natural-resources-recreation-management-minor/>)
- Specialty Agriculture, B.S. (<http://catalog.marshall.edu/undergraduate/programs-az/science/natural-resources-environment/specialty-agriculture-bs/>)

## Courses

 - General Education Course

### Geology

#### **GLY 100 Geologic Hazards & Resources 3 Credit hours**

Introductory course for non-science majors focusing on (i) Earth Hazards; and mitigation, (ii) Climate change and its impacts; and (iii) Earth and Energy resources, their origin, development, and environmental impacts.

**Attributes:** Natural Sciences, Core II Natural Sciences

**Grade Mode:** Normal Grading Mode

#### **GLY 150 Intro Oceanography 3 Credit hours**

Origin of the seas and ocean basins. Processes of marine sedimentation and seawater chemistry. Dynamics of air/sea interaction, circulation, waves and tides. Description of coastal and other marine environments.

**Attributes:** Natural Sciences, Core II Natural Sciences

**Grade Mode:** Normal Grading Mode

#### **GLY 150L Intro Oceanography Lab 1 Credit hour**

A complementary laboratory to Introductory Oceanography, GLY 150. A series of exercises relating to bathymetry, acoustic profiling, marine charts, properties of seawater, sea floor sediments, currents, waves and tides.

**Co-req:** GLY 150

**Attributes:** Natural Sciences, Core II Natural Sciences

**Grade Mode:** Normal Grading Mode

#### **GLY 170 Geology of the National Parks 3 Credit hours**

An introduction to U.S. Parks and Monuments including earth materials, plate tectonic setting, formative geologic processes, and natural history; brief overview of history and purpose of the National Park Service.

**Grade Mode:** Normal Grading Mode

#### **GLY 200 The Dynamic Earth 3 Credit hours**

An elementary but comprehensive physical geology course that deals with the earth's origin, composition, structures, tectonics and processes. Intended primarily for, but not limited to, the science major. 3 lec.

**Attributes:** Natural Sciences, Core II Natural Sciences

**Grade Mode:** Normal Grading Mode

#### **GLY 201 The Earth Through Time 3 Credit hours**

Introduction to 1) the principles used to interpret past physical, biologic, and chemical events archived in rock record, and 2) the history and development of the earth's lithosphere, biosphere, hydrosphere, and atmosphere.

**Attributes:** Natural Sciences, Core II Natural Sciences

**Grade Mode:** Normal Grading Mode

- GLY 210L 🌱 Earth Materials Lab** **1 Credit hour**  
An introduction to laboratory methods and materials as applied to the identification, classification, recovery and uses of earth resources. 2 lab.  
**Attributes:** Natural Sciences, Core II Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 211L 🌱 Earth Through Time Lab** **1 Credit hour**  
Reconstruction of events in earth history based on physical characteristics and arrangement of rock layers and their fossil contents. 2 hr lab (PR: 210L; CR: GLY 201)  
**Attributes:** No Textbook Required, Natural Sciences, Core II Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 212 Geologic Field Methods** **3 Credit hours**  
Introduction to geologic map interpretation, qualitative and quantitative methods of geologic map and cross-section preparation, and basic ArcGIS mapping methods. 2 lec 1 lab. (Field Work).  
**Pre-req:** (GLY 200 with a minimum grade of D or GLY 201 with a minimum grade of D) and (GLY 210L with a minimum grade of D or GLY 211L with a minimum grade of D).  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 280 Special Topics** **1-4 Credit hours**  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 281 Special Topics** **1-4 Credit hours**  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 282 Special Topics** **1-4 Credit hours**  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 283 Special Topics** **1-4 Credit hours**  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 313 Structural Geology** **4 Credit hours**  
Analysis, classification and origin of depositional and deformational structures common to all classes of rocks; their structural history, relationships, and stresses which caused them. 3 lec-2 lab.  
**Pre-req:** GLY 110 or GLY 200.  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 314 Mineralogy** **4 Credit hours**  
Identification, classification, origin, occurrences, and economic uses of minerals and their crystallographic forms. 3 lec-2 lab.  
**Pre-req:** GLY 200 with a minimum grade of D and CHM 211 with a minimum grade of D.  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 320L Geology Lab Techniques** **2 Credit hours**  
Techniques of collection, preparation and analysis of mineral, rock and water samples, and the use of different instruments for obtaining quality data. Will also cover tools used for data interpretation.  
**Pre-req:** GLY 200 (may be taken concurrently) with a minimum grade of D and GLY 210L (may be taken concurrently) with a minimum grade of D.  
**Concurrent PR:** GLY 200 and GLY 210L  
**Grade Mode:** Normal Grading Mode
- GLY 325 Stratigraphy & Sediment** **4 Credit hours**  
Formation, organization, sequence, and correlation of sedimentary rocks; study of the origin, transportation and deposition of rock-forming sediments. 3 lec-2 lab.  
**Pre-req:** GLY 201 with a minimum grade of D and GLY 211L with a minimum grade of D.  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 330 Tectonics** **3 Credit hours**  
Overview of tectonic processes at plate boundaries, orogenic systems, formation of continents and ocean basins, and tectonic analytical methods.  
**Pre-req:** GLY 200 and GLY 201 and GLY 210L and GLY 211L.  
**Grade Mode:** Normal Grading Mode
- GLY 410 Big Bend Field Excursion** **2 Credit hours**  
Field trip to Big Bend National Park, Texas to study the structure, stratigraphy, igneous geology, metamorphic geology, paleontology and natural history of this national park.  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 418 Invertebrate Paleontology** **4 Credit hours**  
Taxonomy, morphology, and paleoecology of body and trace fossils representing the major invertebrate phyla; analysis and interpretation of faunal assemblages; evolution and extinction of species. (PR: GLY 201)  
**Pre-req:** GLY 201 with a minimum grade of D and GLY 211L with a minimum grade of D.  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 420 Principles of Geochemistry** **3 Credit hours**  
Application of chemical principles to geology. Topics include cosmochemistry; distribution of elements in minerals and rocks; aqueous solutions and water-rock interaction; radiometric age dating and stable isotope geology.  
**Pre-req:** CHM 211 with a minimum grade of D and GLY 200 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- GLY 421 Igneous& Metamorphic Petrology** **4 Credit hours**  
Identification and classification of igneous, and metamorphic rocks, their origin and occurrence; their geologic and economic importance. 3 lec-2 lab.  
**Pre-req:** GLY 200 with a minimum grade of D and GLY 314 with a minimum grade of D.  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode
- GLY 423 Sedimentary Petrology** **4 Credit hours**  
Microscopic description of minerals, textures, and fossils in sedimentary rocks, their classification, and interpretation of source area, depositional environment and post-depositional history. 3 lec-2 lab.  
**Pre-req:** GLY 201.  
**Attributes:** Natural Sciences  
**Grade Mode:** Normal Grading Mode

<b>GLY 426 Geophysics</b>	<b>3 Credit hours</b>	<b>GLY 481 Special Topics</b>	<b>1-4 Credit hours</b>
Development of seismic, gravity, magnetism, electrical and thermal methods of studying the structure and dynamics of the earth. 3-lec		<b>Attributes:</b> Natural Sciences	
<b>Pre-req:</b> GLY 200 with a minimum grade of D and GLY 210L with a minimum grade of D and (PHY 201 with a minimum grade of D or PHY 211 with a minimum grade of D) and MTH 229 with a minimum grade of D.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Attributes:</b> Natural Sciences		<b>GLY 482 Special Topics</b>	<b>1-4 Credit hours</b>
<b>Grade Mode:</b> Normal Grading Mode		<b>Attributes:</b> Natural Sciences	
<b>GLY 427 Fossil Fuels</b>	<b>4 Credit hours</b>	<b>Grade Mode:</b> Normal Grading Mode	
Origin and distribution of coal, oil and gas, and methods of exploration and reserve evaluation. 3 lec-2 lab.		<b>GLY 483 Special Topics</b>	<b>1-4 Credit hours</b>
<b>Pre-req:</b> GLY 200.		<b>Attributes:</b> Natural Sciences	
<b>Attributes:</b> Natural Sciences		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>GLY 485 Independent Study</b>	<b>1-4 Credit hours</b>
<b>GLY 451 Principles Geomorphology</b>	<b>4 Credit hours</b>	<b>Attributes:</b> No Textbook Required, Natural Sciences	
Principles of identification and analysis of the world's surficial features in terms of stratigraphy, structure, processes, tectonics and time. 3 lec. 2 lab.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Pre-req:</b> GLY 200 and GLY 210L.		<b>GLY 486 Independent Study</b>	<b>1-4 Credit hours</b>
<b>Attributes:</b> Natural Sciences		<b>Attributes:</b> Natural Sciences	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>GLY 455 Hydrogeology</b>	<b>3 Credit hours</b>	<b>GLY 487 Independent Study</b>	<b>1-4 Credit hours</b>
The properties of water, the hydrologic cycle with emphasis on surface and groundwater processes, the uses, needs and problems associated with water resources. 3 lec.		<b>Attributes:</b> Natural Sciences	
<b>Pre-req:</b> GLY 200 with a minimum grade of D and (MTH 132 with a minimum grade of D or MTH 229 with a minimum grade of D or MTH 229H with a minimum grade of D).		<b>Grade Mode:</b> Normal Grading Mode	
<b>Attributes:</b> Natural Sciences		<b>GLY 488 Independent Study</b>	<b>1-4 Credit hours</b>
<b>Grade Mode:</b> Normal Grading Mode		<b>Attributes:</b> Natural Sciences	
<b>GLY 455L Hydrogeology Laboratory</b>	<b>1 Credit hour</b>	<b>Grade Mode:</b> Normal Grading Mode	
A two-hour laboratory of practical hydrogeologic problem solving. For non-majors, elective.		<b>GLY 491  Capstone Experience</b>	<b>2-4 Credit hours</b>
<b>Pre-req:</b> GLY 455 (may be taken concurrently) with a minimum grade of D.		An independent study involving a research project or internship. Must be approved by Geology faculty. (PR: 20 hours of Geology coursework).	
<b>Concurrent PR:</b> GLY 455		<b>Attributes:</b> Capstone Course, Natural Sciences	
<b>Attributes:</b> Natural Sciences		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>GLY 492  Capstone Experience</b>	<b>2-4 Credit hours</b>
<b>GLY 456 Environmental Geology</b>	<b>4 Credit hours</b>	An independent study involving a research project or internship. Must be approved by Geology faculty. (PR: 20 hours of Geology coursework).	
Consideration of risks posed by natural geo-hazards and from physical/chemical contamination of geologic media. (PR: GLY 200, GLY 210L or equivalent; Recommended: GLY 451)		<b>Attributes:</b> Capstone Course, Natural Sciences	
<b>Pre-req:</b> GLY 200 with a minimum grade of D and GLY 210L with a minimum grade of D.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Attributes:</b> Natural Sciences		<b>GLY 510 Big Bend Field Excursion</b>	<b>2 Credit hours</b>
<b>Grade Mode:</b> Normal Grading Mode		Field trip to Big Bend National Park, Texas to study the structure, stratigraphy, igneous geology, metamorphic geology, paleontology and natural history of this national park.	
<b>GLY 457 Engineering Geology</b>	<b>4 Credit hours</b>	<b>Grade Mode:</b> Normal Grading Mode	
Consideration of geotechnical problems faced by geologists and engineers. Major topics include mechanics and classification of soil and rock, and geotechnical aspects of groundwater.		<b>GLY 518 Invertebrate Paleontology</b>	<b>4 Credit hours</b>
<b>Pre-req:</b> GLY 200 with a minimum grade of D and GLY 210L with a minimum grade of D and (MTH 132 with a minimum grade of D or MTH 229 with a minimum grade of D).		Taxonomy, morphology, and paleoecology of body and trace fossils representing the major invertebrate phyla; analysis and interpretation of faunal assemblages; evolution and extinction of species. (PR: GLY 201)	
<b>Attributes:</b> Natural Sciences		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>GLY 520 Geochemistry</b>	<b>3 Credit hours</b>
<b>GLY 480 Special Topics</b>	<b>1-4 Credit hours</b>	Introduction to the principles of geochemistry. The application of chemistry to the study of the earth and to geologic problems.	
<b>Attributes:</b> Natural Sciences		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>GLY 521 Petrology</b>	<b>4 Credit hours</b>
		Identification and classification of igneous, sedimentary and metamorphic rocks, their origin and occurrence; their geologic and economic. 2 lec-4 lab.	
		<b>Grade Mode:</b> Normal Grading Mode	
		<b>GLY 523 Sedimentary Petrography</b>	<b>4 Credit hours</b>
		Megascopic and microscopic identification and a depositional and post-depositional interpretation of the sedimentary rocks. 3 lec-2 lab.	
		<b>Grade Mode:</b> Normal Grading Mode	

**GLY 527 Fossil Fuels****4 Credit hours**

The origin and occurrence of petroleum, coal, and natural gas; the relationships of accumulations to depositional environments and structural history; methods used in exploration, evaluation and recovery. 3 lec-2 lab.

**Pre-req:** GLY 200.**Grade Mode:** Normal Grading Mode**GLY 530 Computer Methods Geology****4 Credit hours**

The computer will be used for compilation, reduction, data analysis and modelling from a wide range of geological problems. Existing and student developed programs will be used.

**Grade Mode:** Normal Grading Mode**GLY 551 Principles Geomorphology****4 Credit hours**

Identification and analysis of the earth's surficial features in terms of stratigraphy, structure, processes, tectonics, and time. 3 lec 2 lab.

**Grade Mode:** Normal Grading Mode**GLY 555 Hydrogeology****3 Credit hours**

The properties of water, the hydrologic cycle with emphasis on surface and groundwater processes. The uses, needs and problems associated with water resources.

**Grade Mode:** Normal Grading Mode**GLY 555L Hydrogeology Laboratory****1 Credit hour**

Laboratory and field experiments studying principles and concepts of hydrology. 2 lab.

**Grade Mode:** Normal Grading Mode**GLY 556 Environmental Geology****4 Credit hours**

Consideration of risks posed by natural geo-hazards and from physical/chemical contamination of geological media.

**Grade Mode:** Normal Grading Mode**GLY 557 Engineering Geology****4 Credit hours**

Consideration of geotechnical problems faced by geologists and engineers. Major topics include mechanics and classification of soil and rock, and geotechnical aspects of groundwater.

**Grade Mode:** Normal Grading Mode**GLY 580 Special Topics****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 581 Special Topics****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 582 Special Topics****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 583 Special Topics****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 585 Independent Study****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 586 Independent Study****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 587 Independent Study****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 588 Independent Study****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 640 Physical Aspects Geology****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 641 Biological Aspect Geology****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 642 Chemical Aspects Geology****1-4 Credit hours****Grade Mode:** Normal Grading Mode**GLY 681 Thesis****1-6 Credit hours****Attributes:** Thesis**Grade Mode:** Normal Grading Mode**Natural Resources and the Environment****NRE 111 🌿 Living Systems****4 Credit hours**

This course is designed to equip students to observe and create their own questions, test them, and continue the process of scientific inquiry related to living systems.

**Attributes:** Natural Sciences, Core II Natural Sciences**Grade Mode:** Normal Grading Mode**NRE 120 🗣️ Discussion in Environ Sci (CT)****3 Credit hours**

Critical thinking course designed to examine and explore issues in environmental science including protection of terrestrial and aquatic resources and production of energy and food for a growing population.

**Attributes:** Critical Thinking**Grade Mode:** Normal Grading Mode**NRE 200 Introduction to Agriculture****3 Credit hours**

This course will discuss scientific concepts essential to agriscience and examine practices, careers, and new directions in various fields in agriculture.

**Grade Mode:** Normal Grading Mode**NRE 212 Energy****3 Credit hours**

The course introduces the students to the properties and the interfaces of biological and physical systems with emphasis on energy concepts, production and distribution in both systems.

**Attributes:** Natural Sciences**Grade Mode:** Normal Grading Mode**NRE 220 🌍 Human Dimensions Nat Res (CT)****3 Credit hours**

This course provides an overview of human-nature relationship from the perspective of conservation and natural resource management.

**Attributes:** Critical Thinking**Grade Mode:** Normal Grading Mode**NRE 280 Special Topics****1-4 Credit hours**

A course covering topics not treated in regular course offerings.

**Grade Mode:** Normal Grading Mode**NRE 281 Special Topics****1-4 Credit hours**

A course covering topics not treated in regular course offerings.

**Grade Mode:** Normal Grading Mode**NRE 282 Special Topics****1-4 Credit hours**

A course covering topics not treated in regular course offerings.

**Grade Mode:** Normal Grading Mode**NRE 283 Special Topics****1-4 Credit hours**

A course covering topics not treated in regular course offerings.

**Grade Mode:** Normal Grading Mode**NRE 285 Independent Study****1-4 Credit hours**

Independent study for selected sophomores or advanced freshman under supervision of faculty; may be repeated only once.

**Grade Mode:** Normal Grading Mode**NRE 286 Independent Study****1-4 Credit hours**

Independent study for selected sophomores or advanced freshman under supervision of faculty; may be repeated only once.

**Grade Mode:** Normal Grading Mode



- NRE 287 Independent Study** **1-4 Credit hours**  
Independent study for selected sophomores or advanced freshman under supervision of faculty; may be repeated only once.  
**Grade Mode:** Normal Grading Mode
- NRE 288 Independent Study** **1-4 Credit hours**  
Independent study for selected sophomores or advanced freshman under supervision of faculty; may be repeated only once.  
**Grade Mode:** Normal Grading Mode
- NRE 300 Principles of Soil Science** **3 Credit hours**  
This course will examine the principles of soils, including origin, composition, classification, and physical, chemical, and biological properties and processes, as well as agricultural and environmental applications.  
**Pre-req:** CHM 212 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 301 Principles of Soil Science Lab** **2 Credit hours**  
A laboratory course that demonstrates the application of concepts introduced in NRE 300 Principles of Soil Science.  
**Pre-req:** NRE 300 (may be taken concurrently) with a minimum grade of D and CHM 212 with a minimum grade of D.  
**Concurrent PR:** NRE 300  
**Grade Mode:** Normal Grading Mode
- NRE 302 Animal Production** **3 Credit hours**  
This course will examine the principles of animal production through the application of anatomy, physiology, behavior, nutrition, reproduction, breeding, and genetics in the production and management of farm animals.  
**Pre-req:** BSC 121 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 320 Nature Enviro Problems** **3 Credit hours**  
The effects of human activity on ecological, political, economic, and cultural systems are examined. Particular attention is given to present human population growth, industrial activities, and energy availability.  
**Grade Mode:** Normal Grading Mode
- NRE 321 Resol Environ Problems** **3 Credit hours**  
Students examine case studies of current environmental problems and propose methods of remediation. Cultural, political, economic, as well as ecological and physiographic factors are considered.  
**Grade Mode:** Normal Grading Mode
- NRE 322 Assess I: Terrestrial Systems** **4 Credit hours**  
Use of scientific procedure and current technology to characterize and quantify sensitive elements of terrestrial ecosystems and to assess human impact on these systems.  
**Pre-req:** (IST 111 with a minimum grade of D or NRE 111 with a minimum grade of D) or BSC 104 with a minimum grade of D or BSC 120 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 323 Assessment II: Aquatic Ecology** **4 Credit hours**  
Use of scientific procedures and current technology to characterize and quantify sensitive elements of aquatic ecosystems and to assess human impact on these systems.  
**Pre-req:** IST 111 or NRE 111 or BSC 104 or BSC 120.  
**Grade Mode:** Normal Grading Mode
- NRE 400 Soil Fertility/Plant Nutrition** **4 Credit hours**  
This course will examine properties of soil fertility, its relationship to plan nutrition, and practices in nutrient management and fertilizer application.  
**Pre-req:** BSC 121 with a minimum grade of D and NRE 300 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 401 Horticulture** **4 Credit hours**  
This course will examine the principles and practices in horticulture and apply these practices through a semester service project.  
**Pre-req:** BSC 121 with a minimum grade of D and NRE 310 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 402 Sustainable Agriculture** **3 Credit hours**  
This course will examine the principles of sustainable agriculture and its relationship with natural resources while identifying challenges to agricultural sustainability and frontiers in the field.  
**Pre-req:** NRE 200 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 403 Agricultural Entomology** **4 Credit hours**  
Globally, insects have tremendous impacts on agriculture. This course introduces students to insects and their roles in agriculture including integrated pest management and pollination ecology.  
**Pre-req:** BSC 121 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 423 GIS and Data Systems** **3 Credit hours**  
Course focuses on the relationships among the scientific method, data structures, and geographic images. Students relate hypothesis formation and databases through the development of ARCMAP documents.  
**Grade Mode:** Normal Grading Mode
- NRE 425 Water Policy and Regulations** **3 Credit hours**  
Examination of how aquatic resources are protected for humans and species of concern by current regulatory framework.  
**Attributes:** No Textbook Required  
**Grade Mode:** Normal Grading Mode
- NRE 431 Aquatic Toxicology** **4 Credit hours**  
This course will introduce students to the principles of aquatic toxicology including regulations driving biological criteria, development of laboratory toxicity testing and test methodology.  
**Pre-req:** BSC 105 with a minimum grade of D or BSC 121 with a minimum grade of D or IST 323 with a minimum grade of D or NRE 323 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 435 Biomonitoring** **4 Credit hours**  
Biomonitoring is the use of organisms to assess habitat and water quality of a stream. Current aquatic biomonitoring focuses on the utilization of benthic invertebrates and fishes communities.  
**Pre-req:** BSC 120 with a minimum grade of D or IST 323 with a minimum grade of D or NRE 323 with a minimum grade of D.  
**Grade Mode:** Normal Grading Mode
- NRE 470  ES Internship** **3 Credit hours**  
A supervised internship in an area of natural resources and the environment.  
**Attributes:** Capstone Course  
**Grade Mode:** Normal Grading Mode

<b>NRE 480 Special Topics</b>	<b>1-4 Credit hours</b>	<b>NRE 531 Aqua Toxicology</b>	<b>4 Credit hours</b>
A course covering topics not treated in regular course offerings.		This course will introduce students to the principles of aquatic toxicology including regulations driving biological criteria, development of laboratory toxicity testing and test methodology.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>NRE 481 Special Topics</b>	<b>1-4 Credit hours</b>	<b>NRE 540 Seminar I</b>	<b>1 Credit hour</b>
A course covering topics not treated in regular course offerings.		Introduction to graduate research and individual topics, development of literature research skills, reading and discussion of keystone papers, support for research project prospectus development and beginning the literature portfolio for the thesis.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>NRE 482 Special Topics</b>	<b>1-4 Credit hours</b>	<b>NRE 560 Seminar II</b>	<b>1 Credit hour</b>
A course covering topics not treated in regular course offerings.		This course focus is discussion of fundamental and cornerstone literature from the field of nature resources. Emphasis will be given to research methods and individual student project development.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>NRE 483 Special Topics</b>	<b>1-4 Credit hours</b>	<b>NRE 580 Special Topics</b>	<b>1-4 Credit hours</b>
A course covering topics not treated in regular course offerings.		Study of an advanced topic not normally covered in other courses.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>NRE 485 Independent Study</b>	<b>1-4 Credit hours</b>	<b>NRE 581 Special Topics</b>	<b>1-4 Credit hours</b>
Independent study for selected juniors and seniors under supervision of faculty; may be repeated only once.		Study of an advanced topic not normally covered in other courses.	
<b>Attributes:</b> No Textbook Required		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRE 582 Special Topics</b>	<b>1-4 Credit hours</b>
<b>NRE 486 Independent Study</b>	<b>1-4 Credit hours</b>	Study of an advanced topic not normally covered in other courses.	
Independent study for selected juniors and seniors under supervision of faculty; may be repeated only once.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRE 583 Special Topics</b>	<b>1-4 Credit hours</b>
<b>NRE 487 Independent Study</b>	<b>1-4 Credit hours</b>	Study of an advanced topic not normally covered in other courses.	
Independent study for selected juniors and seniors under supervision of faculty; may be repeated only once.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRE 585 Independent Study</b>	<b>1-4 Credit hours</b>
<b>NRE 488 Independent Study</b>	<b>1-4 Credit hours</b>	Independent Study (1-4 hrs)	
Independent study for selected juniors and seniors under supervision of faculty; may be repeated only once.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRE 586 Independent Study</b>	<b>1-4 Credit hours</b>
<b>NRE 490 ES/NRRM Capstone Prep</b>	<b>3 Credit hours</b>	Independent Study (1-4 hrs)	
Prepares students for the senior project, internship experience, and for careers beyond graduation. Life skills are introduced by building on communication, organization, and project management skills (capstone).		<b>Grade Mode:</b> Normal Grading Mode	
<b>Attributes:</b> No Textbook Required		<b>NRE 587 Independent Study</b>	<b>1-4 Credit hours</b>
<b>Grade Mode:</b> Normal Grading Mode		Independent Study (1-4 hrs)	
<b>NRE 491  ES Senior Capstone</b>	<b>3 Credit hours</b>	<b>Grade Mode:</b> Normal Grading Mode	
Students develop and complete a research project under the direction of a faculty member in the NRE department (capstone).		<b>NRE 588 Independent Study</b>	<b>1-4 Credit hours</b>
<b>Pre-req:</b> NRE 490 with a minimum grade of D.		Independent Study (1-4 hrs)	
<b>Attributes:</b> Capstone Course, No Textbook Required		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRE 640 Seminar III</b>	<b>1 Credit hour</b>
<b>NRE 500 Soil Fertility/Plant Nutrition</b>	<b>4 Credit hours</b>	The course utilizes relevant literature from the Natural Sciences to investigate data analysis and presentation methods. Topics include statistical methods selection, graphical presentations, journal selection and interpretation of data outcomes.	
This course will examine properties of soil fertility, its relationship to plan nutrition, and practices in nutrient management and fertilizer application.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRE 660 Seminar IV</b>	<b>1 Credit hour</b>
<b>NRE 502 Sustainable Agriculture</b>	<b>3 Credit hours</b>	The course focuses on transition to professional opportunities beyond graduate school. Discussions will include scientific publication and public presentation in multiple venues and formats, expectations of various career options and applications of science in decision making.	
This course will examine the principles of sustainable agriculture and its relationship with natural resources while identifying challenges to agricultural sustainability and frontiers in the field.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRE 670 Independent Study</b>	<b>1-4 Credit hours</b>
<b>NRE 525 Water Policy &amp; Regulations</b>	<b>3 Credit hours</b>	Independent Study	
Examination of how aquatic resources are protected for humans and species of concern by current regulatory framework.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode			

**NRE 671 Independent Study** 1-4 Credit hours  
Independent Study  
**Grade Mode:** Normal Grading Mode

**NRE 672 Independent Study** 1-4 Credit hours  
Independent Study  
**Grade Mode:** Normal Grading Mode

**NRE 673 Independent Study** 1-4 Credit hours  
Independent Study  
**Grade Mode:** Normal Grading Mode

**NRE 680 Special Topics** 1-4 Credit hours  
Study of an advanced topic not normally covered in other courses.  
**Grade Mode:** Normal Grading Mode

**NRE 681 Thesis** 1-8 Credit hours  
Thesis  
**Grade Mode:** Normal Grading Mode

**Natural Resource Recreation Management**

**NRRM 101 Intro Natural Res & Rec Mgmt** 3 Credit hours  
An orientation to the profession and its settings, emphasizing history, trends, concepts, and relationships to other fields.  
**Grade Mode:** Normal Grading Mode

**NRRM 110 Outdoor Leadership: Canoeing** 1 Credit hour  
This course is designed to give students the skills essential for the pursuit of employment in guiding participants on flat-water canoe courses in backcountry settings.  
**Grade Mode:** Normal Grading Mode

**NRRM 111 Outdoor Leadership: Fly Fish** 1 Credit hour  
This course is designed to give students the skills essential for the pursuit of being able to guide participants on fly fishing excursions in the backcountry.  
**Grade Mode:** Normal Grading Mode

**NRRM 112 Outdoor Leadership: Bass Fish** 1 Credit hour  
This course is designed to give students the skills essential to pursue employment as a guide on bass fishing excursions in the backcountry.  
**Grade Mode:** Normal Grading Mode

**NRRM 113 Outdoor Leadership: Backpack** 1 Credit hour  
This course is designed to give students the foundation skills essential in the pursuit of being leading participants on backcountry backpacking experiences. Leave No Trace ethics will be taught.  
**Grade Mode:** Normal Grading Mode

**NRRM 156 Bicycling** 1 Credit hour  
**Grade Mode:** Normal Grading Mode

**NRRM 158 Downhill Skiing** 1 Credit hour  
**Grade Mode:** Normal Grading Mode

**NRRM 200 Analytical Methods: Statistics** 4 Credit hours  
Students develop an understanding of statistical reasoning through the use of software to generate, summarize, and draw conclusions from data. Course enhances statistical technique dexterity through analysis of applied problems.  
**Grade Mode:** Normal Grading Mode

**NRRM 201 Recreational Activities** 3 Credit hours  
**Grade Mode:** Normal Grading Mode

**NRRM 231 Nature Study** 3 Credit hours  
Designed to provide students with the fundamental understanding of and for the delivery of nature based educational programs offered through an experiential framework.  
**Grade Mode:** Normal Grading Mode

**NRRM 280 Special Topics** 1-4 Credit hours  
**Grade Mode:** Normal Grading Mode

**NRRM 281 Special Topics** 1-4 Credit hours  
**Grade Mode:** Normal Grading Mode

**NRRM 282 Special Topics** 1-4 Credit hours  
**Grade Mode:** Normal Grading Mode

**NRRM 283 Special Topics** 1-4 Credit hours  
**Grade Mode:** Normal Grading Mode

**NRRM 301 Intro to Outdoor Recreation** 3 Credit hours  
Organization, administration, and delivery of outdoor recreation activities and resources. Emphasis upon federal, state, and local government programs and areas.  
**Grade Mode:** Normal Grading Mode

**NRRM 310 Environmental Interpretation** 3 Credit hours  
Principles and techniques of environmental interpretation as practiced in federal, state, and private agencies.  
**Grade Mode:** Normal Grading Mode

**NRRM 311 Intro to Environmental Educ** 3 Credit hours  
This course is the study of environmental education, its foundations, emergence in the 1960's, its evolution, the systems approach to it, and the application of it in the field.  
**Grade Mode:** Normal Grading Mode

**NRRM 320 Sports & Campus Rec Mgmt** 3 Credit hours  
This course will deal with the fields of recreational sports and campus recreation management. It will present the foundations of both fields, the development, implementation, and trends in today's programs.  
**Grade Mode:** Normal Grading Mode

**NRRM 330 Concepts Philosophies in NRRM** 3 Credit hours  
A systematic approach to the concepts and philosophies for managing wildland, wilderness, and protected areas.  
**Grade Mode:** Normal Grading Mode

**NRRM 340 Special Event Management** 3 Credit hours  
This course will study the processes for event facilitation. Special attention will be given to the roles and skills utilized by a variety of recreation managers.  
**Grade Mode:** Normal Grading Mode

**NRRM 350 Adventure Education Leadership** 3 Credit hours  
This course focuses on preparing students to be outdoor adventure education leaders, facilitating programs in both the front and back country utilizing adventure education techniques in an outdoor setting.  
**Grade Mode:** Normal Grading Mode

**NRRM 360 Tourism Planning & Management** 3 Credit hours  
The course will examine the critical issues addressed by tourism planning and management, which are the positive and negative influences of tourism on the destination's economy, society, culture, and environment.  
**Grade Mode:** Normal Grading Mode

**NRRM 361 Visitor Behavior in NRRM** 3 Credit hours  
This course provides an overview and analysis of individual and group behavior as it pertains to consumer activity in the context of recreation and tourism resource environments.  
**Grade Mode:** Normal Grading Mode

<b>NRRM 362 Ecotourism: Admin and Mgmt</b>	<b>3 Credit hours</b>	<b>NRRM 453 Op Mgt OHV Trail Systems</b>	<b>3 Credit hours</b>
This course will examine the theoretical foundations, applications and best management practices in ecotourism. Other minor topics include: sustainability, nature-based and adventure tourism; sociocultural, environmental, and economic impacts of ecotourism.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRRM 480 Special Topics</b>	<b>1-4 Credit hours</b>
<b>NRRM 380 Rec Resource Oper. and Admin</b>	<b>3 Credit hours</b>	<b>Grade Mode:</b> Normal Grading Mode	
Focused on the management, operation, and administration practices of recreation resource areas. Includes supervision of personnel, budgeting, and public relations for a variety of park and public land organizational structures.		<b>NRRM 481 Special Topics</b>	<b>1-4 Credit hours</b>
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>NRRM 400 Leisure &amp; Aging</b>	<b>3 Credit hours</b>	<b>NRRM 482 Special Topics</b>	<b>1-4 Credit hours</b>
A course presenting an overview of leisure services for the elderly. Topics include research results, theories, and modern day trends. A wellness model will be included.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRRM 483 Special Topics</b>	<b>1-4 Credit hours</b>
<b>NRRM 402 Research Eval &amp; Assess in NRRM</b>	<b>3 Credit hours</b>	<b>Grade Mode:</b> Normal Grading Mode	
Theoretical & practical approach to research, evaluation and assessment of the social sciences of natural resources and recreational management.		<b>NRRM 484 Special Topics</b>	<b>1-3 Credit hours</b>
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>NRRM 405 Park &amp; Recreation Ecology</b>	<b>3 Credit hours</b>	<b>NRRM 485 Independent Study</b>	<b>1-4 Credit hours</b>
The course is designed to help students identify and evaluate the level of resource impact, understand factors that cause impacts, and suggest management actions to minimize impacts under given conditions.		<b>Attributes:</b> No Textbook Required	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>NRRM 410 Maint of Nat Res &amp; Rec</b>	<b>3 Credit hours</b>	<b>NRRM 486 Independent Study</b>	<b>1-4 Credit hours</b>
A study of the knowledge and skills necessary to supervise and administer the general development and maintenance of park and recreation areas and facilities.		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRRM 487 Independent Study</b>	<b>1-4 Credit hours</b>
<b>NRRM 411 Rec Resource Planning &amp; Design</b>	<b>3 Credit hours</b>	<b>Grade Mode:</b> Normal Grading Mode	
Basic considerations in the planning and design of natural areas, parks, forests, recreation, and sport area infrastructure, facilities and associated amenities.		<b>NRRM 488 Independent Study</b>	<b>1-4 Credit hours</b>
<b>Attributes:</b> No Textbook Required		<b>Grade Mode:</b> Normal Grading Mode	
<b>Grade Mode:</b> Normal Grading Mode		<b>NRRM 490 🌿 Internship</b>	<b>6 Credit hours</b>
<b>NRRM 432 Wilderness/Protected Area Mgmt</b>	<b>3 Credit hours</b>	A supervised 40-hour per week, 6 week internship in which the students work with park and recreation agencies. (PR: NRRM major. Advisor approval required.)	
This course will examine the historic and current philosophies of wilderness and protected area management as applicable to NGOs, local, state, and federal land management programs.		<b>Attributes:</b> Capstone Course, No Textbook Required	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>NRRM 433 GIS/RS in Natural Resources</b>	<b>3 Credit hours</b>		
Focusing on natural resource management, the course will explore techniques and procedures required for spatially explicit data analysis in park and protected area applications.			
<b>Grade Mode:</b> Normal Grading Mode			
<b>NRRM 450 Intro OHV Recreation</b>	<b>3 Credit hours</b>		
<b>Grade Mode:</b> Normal Grading Mode			
<b>NRRM 451 Plan Design OHV Trails</b>	<b>3 Credit hours</b>		
<b>Grade Mode:</b> Normal Grading Mode			
<b>NRRM 452 Construction OHV Trails</b>	<b>3 Credit hours</b>		
A course designed to instruct students in contemporary methods and techniques of constructing OHV trails and related facilities.			
<b>Grade Mode:</b> Normal Grading Mode			

## Faculty

### Professors

Armstead, Caudill, El-Shazly

### Associate Professors

Jones, Kim

### Assistant Professors

Brink-Roby, Gage