

# Earth Sciences

## Department Information

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Department of Earth Sciences website

<http://southalabama.edu/colleges/artsandsci/earthsci/>

The Department of Earth Sciences includes the disciplines of Geography, Geology, and Meteorology, and it offers a B.S. degree as well as a minor in each of these three majors. Students can also earn a GIS Certificate and/or a minor in Geographic Information Technology (GIT) Geography, which is both a natural and a social science, studies the location, spatial distribution, and spatial interaction of Earth's natural and human environments. Courses and research in the program encompass the broad subfields of Human Geography (for example, tourism, health, and social justice), Physical Geography (like climatology, natural hazards, and environmental geography), Regional Geography (International Economics and Relations), and Geographic Techniques, including Geographic Information Science and Technology (GIS/GIT) and Remote Sensing. Upon completing their degree, geography students are employed in government, industry, and nonprofits in multiple kinds of work environments (includes field, lab, computer, office and work).

Geology is an interdisciplinary physical science pertaining to the study of the Earth. Courses and research within the department address the chemical and physical properties of minerals, rocks, soils, sediments, and water; the processes that shape the Earth's surface; the stratigraphic, paleobiological, and geochemical records of Earth history; and the processes associated with deformation in the Earth's crust and mantle. Together an understanding is obtained of present-day, historical, and long-term feedbacks between global systems, as well as the origin and occurrence of our natural resources.

Meteorology is the study of atmospheric phenomena and the processes that cause weather. The science of meteorology is firmly rooted in basic physical laws governing mass, momentum, and energy. Many weather processes are simulated by complex computer models; however, accurate weather analysis and forecasting often requires meteorologists to identify and conceptualize weather patterns often missed by automated techniques.

The programs of the Department of Earth Sciences are designed to give the non-major a background in Earth and atmospheric science and the human impact on the landscape as part of a general education. Students pursuing a degree in Geography, Geology, or Meteorology must also have a minor in another discipline.

The Department of Earth Sciences offers a departmental honors program that allows exceptional students to pursue independent research. Students work with a faculty committee to choose an Earth Sciences research project (Geography, Geology, Meteorology), develop a prospectus, and complete a senior thesis. Students completing this program graduate with departmental honors.

Requirements for successful completion of an honors degree in Geography, Geology, or Meteorology include a GPA of at least 3.50 at graduation and completion of ES 492 (Honors Earth Sciences Seminar), ES 497 (Senior Thesis Prospectus), and six hours of ES 499 (Senior Honors Thesis). These classes are in addition to those required for the major in Geography, Geology, or Meteorology. All honors courses are listed under the prefix ES. Students interested in Earth Sciences honors must apply for the program by their junior year. Complete requirements are available on the departmental web page.

All first-time freshmen must successfully complete CAS 100: First Year Experience as a degree requirement. Students must enroll during their first term at USA, except for summer-entry students who must enroll in the fall semester following entry. Students must demonstrate technology proficiency by passing the designated class in their major. GEO 331 for Geography majors, GY 301 for Geology majors, or MET 455 for Meteorology majors.

### Graduate Studies

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Although the Department of Earth Sciences has no graduate degree program, courses, including Geographic Information Technology (GIT), are offered at the graduate level for students enrolled in Biology, Public Administration, Marine Sciences and Environmental Toxicology, and others who need such course work. Contact the Department for more information.

## Areas Of Study

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Geographic Information Science (GIS) Certificate  
 Geography (BS)  
 Geology (BS)  
 Meteorology (BS) - Broadcast Met Track  
 Meteorology (BS) - Graduate School Track  
 Meteorology (BS) - Professional Track  
 Minor in Geographic Information Technology  
 Minor in Geography  
 Minor in Geology  
 Minor in Meteorology

## Courses

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### Earth Sciences (ES)

#### **ES 301 Writing for the Earth Sci -W 3 cr**

This course is designed to introduce students to basic scientific writing skills. Participants will review the general principles of clear writing and will apply these principles to writing for a specific audience. Particular emphasis will be placed on conveying the significance of research, outlining the aims, and discussing the results for scientific papers. Pre-requisite: EH 101 Minimum Grade of C or EH 102 Minimum Grade of C.

#### **ES 492 Honors Earth Sciences Sem - H 3 TO 4 cr**

Multidisciplinary (Geography, Geology, Meteorology) topics not covered in current Department of Earth Sciences courses. Topic announced prior to registration. Prerequisites: acceptance into the University Honors Program, the Earth Sciences Departmental Honors Program, or by permission of the Chair of Earth Sciences. (Completion of this course is required for the Earth Sciences Departmental Honors students)

#### **ES 497 Senior Thesis Prospectus - H 2 cr**

With the guidance and advice of a Senior Thesis Committee, students will identify a suitable research project in Earth Sciences (Geography, Geology, Meteorology) and develop a thesis prospectus to conduct this research during their senior year. The Senior Thesis prospectus will be evaluated by the committee which must pass it before thesis research can formally begin. Prerequisites: establishment of a senior thesis committee; acceptance into the Departmental Honors Program.

#### **ES 499 Senior Honors Thesis - H - W 3 cr**

With the guidance and advice of a Senior Thesis Committee, students will carry out an in-depth research project in Earth Sciences (Geography, Geology, Meteorology) according to an accepted Thesis Prospectus during their senior year. This course will be repeated for up to six (6) credits. Prerequisites: Geography, Geology, Meteorology major, senior status; acceptance into the Departmental or University Honors Program. Pre-requisite: ES 497 Minimum Grade of C or HON 301 Minimum Grade of C and (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C).

### Geographic Info Technology (GIT)

#### **GIT 420 Computer Apps in Earth Science 4 cr**

An introduction to basic Python programming, with examples and exercises pertinent to Earth Science and GIS applications. Pre-requisite: MA 112 Minimum Grade of D or MA 110 Minimum Grade of C.

#### **GIT 442 Remote Sensing II 4 cr**

Analysis of remotely sensed digital data for detection and mapping of Earth resources. Minimum grade of "B" needed in course prerequisite. Fee. Pre-requisite: (GEO 332 Minimum Grade of B or GY 332 Minimum Grade of B).

#### **GIT 460 Intro to GIT 4 cr**

Fundamentals of Geographic Information Systems technology, including software functionality (ArcGIS), data processing, cartography and spatial analysis. Fee. Pre-requisite: CIS Proficiency Exam P

**GIT 461 GIT Applications I-Environment 4 cr**

Application of Geographic Information Systems to the studies of the natural environment. Fee.

Pre-requisite: (GIT 460 Minimum Grade of C or GEO 460 Minimum Grade of C or GY 460 Minimum Grade of C).

**GIT 462 GIT Apps II-Business/Soc Sci 4 cr**

Application of Geographic Information Systems to Business and the Social Sciences. Prerequisite: GIS 460, with a grade of "C" or better, or permission of instructor. Fee.

Pre-requisite: (GIT 460 Minimum Grade of C or GEO 460 Minimum Grade of C or GY 460 Minimum Grade of C).

**GIT 490 Special Topics 2 TO 4 cr**

Geographic Information Technology topics not covered in current GIT courses. May be repeated when content varies for a maximum of 8 credit hours.

Pre-requisite: GIT 460 Minimum Grade of C or GEO 460 Minimum Grade of C or GY 460 Minimum Grade of C.

**GIT 494 Directed Studies 2 TO 4 cr**

Geographic Information Technology topics not covered in current GIT courses. May be repeated when content varies for a maximum of 8 credit hours.

Pre-requisite: GIT 460 Minimum Grade of C or GEO 460 Minimum Grade of C or GY 460 Minimum Grade of C.

**GIT 496 Internship in GIT 1 TO 4 cr**

On-the-job learning through occupational or professional work with an approved firm or agency. Open to geography majors only. No more than 4 hours of internship credit is allowed.

Pre-requisite: GIT 460 Minimum Grade of C or GEO 460 Minimum Grade of C or GY 460 Minimum Grade of C.

**GIT 520 Computer Apps in Earth Science 4 cr**

An introduction to basic Python programming, with examples and exercises pertinent to Earth Sciences and GIS applications.

Pre-requisite: MA 112 Minimum Grade of D or MA 110 Minimum Grade of D.

**GIT 542 Remote Sensing II 4 cr**

Analysis of remotely sensed digital data for detection and mapping of Earth resources. Minimum grade of "B" needed in course prerequisite. Special project required. Fee.

Pre-requisite: (GEO 332 Minimum Grade of B or GY 332 Minimum Grade of B).

**GIT 560 Intro to GIT 4 cr**

Fundamentals of Geographic Information Systems technology, including software functionality (ArcGIS), data processing, cartography and spatial analysis. Credit for GIT 460 and GIT 560 not allowed. Special project required. Fee.

Pre-requisite: CIS 150 Minimum Grade of B or CIS Proficiency Exam P .

**GIT 561 GIT Apps I-Environment - C 4 cr**

Application of Geographic Information Systems to the studies of the natural environment. Credit for GIT 461 and GIT 561 not allowed. Special project required. Fee.

Pre-requisite: (GIT 460 Minimum Grade of C or GIT 560 Minimum Grade of C or GEO 460 Minimum Grade of C or GY 460 Minimum Grade of C or GEO 560 Minimum Grade of C).

**GIT 562 GIT Apps II-Business/Soc Sci 4 cr**

Application of Geographic Information Systems to business and the social science. Credit for GIT 462 and GIT 562 not allowed. Special project required. Fee.

Pre-requisite: (GIT 460 Minimum Grade of C or GEO 460 Minimum Grade of C or GY 460 Minimum Grade of C or GIT 560 Minimum Grade of C or GEO 560 Minimum Grade of C).

**GIT 590 Special Topics - 2 TO 4 cr**

Geographic Information Technology topics not covered in current GIT courses. May be repeated when content varies for a maximum of 8 credit hours.

Pre-requisite: GIT 460 Minimum Grade of C or GIT 560 Minimum Grade of C or GEO 460 Minimum Grade of C or GY 460 Minimum Grade of C or GEO 560 Minimum Grade of C.

**GIT 594 Directed Studies 1 TO 4 cr**

Graduate level independent study under the direction of a member of the graduate faculty. May be used to learn new techniques or to explore research questions of special interests.

## Geography (GEO)

**GEO 101L Atmospheric Processes Lab 1 cr**

Laboratory exercises associated with GEO 101. GEO 101 must be taken concurrently. Together, GEO 101 and GEO 101L count as one laboratory science course, partially fulfilling general education requirements. Fee.

Co-requisite: GEO 101

**GEO 102L Landscape Processes Lab 1 cr**

Laboratory exercises associated with GEO 102. GEO 102 must be taken concurrently. Together, GEO 102 and GEO 102L count as one laboratory science course, partially fulfilling general education requirements. Fee.

Co-requisite: GEO 102

**GEO 101 Atmospheric Processes 3 cr**

Introduces students to the natural science branch of geography. Emphasizes Earth-Sun relationships, weather and climate. Core Course.

Co-requisite: GEO 101L

- GEO 102 Landscape Processes** 3 cr  
Introduces students to the natural science branch of geography. Emphasizes spatial patterns and processes related to natural landscape regions and landforms. Core Course.  
Co-requisite: GEO 102L
- GEO 114 Intro to Human Geography** 3 cr  
This course introduces students to the social sciences branch of geography. Emphasis is placed on the location, spatial arrangement, and spatial interaction of the human environment which includes: population, culture, geopolitics, economic activity, and settlements. Core Course.
- GEO 115 World Regional Geography** 3 cr  
A survey of the major regions of the world, excluding North America, and the interrelationship of environmental, cultural, economic, and political factors that characterize each. Core Course.
- GEO 201 Geography Orientation** 1 cr  
This 1-credit hour course will cover topics that are important to geography students, such as: which geography courses to choose, the major sub-disciplines of geography, and career choices available for geography majors. You will meet the Geography faculty as they give brief overviews of the courses they teach and their research interests. Field trips, which will generally take place during the class time, are included in the course and will showcase examples of the research interests of faculty members. Core Course.
- GEO 310 Environmental Earth Science** 3 cr  
A spatial perspective on major global environmental problems. Topics include population pressure; loss of biodiversity; ozone depletion; global warming; water, energy, and mineral resources, food supplies, waste disposal, geologic hazards, and political/economic forces (identical to GY 310).  
Pre-requisite: (GY 101 Minimum Grade of D or GY 111 Minimum Grade of D) or GEO 101 Minimum Grade of D or GEO 102 Minimum Grade of D.
- GEO 312 World Economic Geog** 3 cr  
Emphasis is placed on the location, spatial distribution, and spatial interaction of economic activities within a global context. Topics covered include population, natural resources, primary, secondary and tertiary activities, development and international trade and aid. Students will write technical reports using word processing and spreadsheet software.  
Pre-requisite: GEO 114 Minimum Grade of D and (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C).
- GEO 313 Geography of U.S. and Canada** 3 cr  
An analysis of the environmental, historical, cultural, and economic factors that create the spatial patterns, development processes and distinctiveness of Canada and the United States.
- GEO 314 Geography of Europe** 3 cr  
An analysis of the environmental, historical, social and economic factors that create the diversity of countries and their unique spatial characteristics on the subcontinent of Europe.
- GEO 315 Geography of Latin America** 3 cr  
A systematic survey of Latin America landscapes. Attention is directed to natural resources, human activities and regional differentiation.  
Pre-requisite: GEO 101 Minimum Grade of D or GEO 102 Minimum Grade of D or GEO 114 Minimum Grade of D or GEO 115 Minimum Grade of D.
- GEO 317 Mountain Geography** 3 cr  
This course studies the mountainous regions of the world from a regional geography perspective. Course topics will include both physical and cultural aspects: their origins, historic attitudes towards mountains, the sacred mountains, their physical features, population and human occupation, climates, biota, and current threats to mountain environments. We will study the role of human activity in affecting mountain environments as well as the effect of mountains on people.  
Pre-requisite: EH 102 Minimum Grade of C.
- GEO 320 Alabama Geography** 3 cr  
Spatial study of physical and human features in Alabama. Includes geomorphology, climate, vegetation, agriculture, development, population, and environmental issues within the state.  
Pre-requisite: (GEO 101 Minimum Grade of D or GEO 102 Minimum Grade of D or GEO 114 Minimum Grade of D or GEO 115 Minimum Grade of D) and (EH 102 Minimum Grade of D or EH 105 Minimum Grade of D).
- GEO 321 Nat'l Parks Conservation** 3 cr  
An analysis of the motives and processes for establishing national parks and nature reserves, the primary conservation and preservation issues they have and the influences of ecology, politics, and culture on their planning and management. U.S. national parks are emphasized.  
Pre-requisite: (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C) and (GEO 101 Minimum Grade of D or GEO 102 Minimum Grade of D or GEO 114 Minimum Grade of D or GEO 115 Minimum Grade of D).
- GEO 331 Computer Graphs and Maps** 4 cr  
Introductory review of the application of computers to the production of graphs and thematic maps for geographical analysis. Core course. Meets computer proficiency requirement for Geography majors. Fee.  
Pre-requisite: GEO 102 Minimum Grade of C and GEO 102L Minimum Grade of C.
- GEO 332 Remote Sensing I** 4 cr  
Interpretation of maps, air photos and satellite images (identical to GY 332). Fee. Core course.  
Pre-requisite: GEO 102 Minimum Grade of C and GEO 102L Minimum Grade of C. GEO 102 and GEO 102L can be taken concurrently with this course.

**GEO 365 Urban Geography and Planning 3 cr**

Concentrates upon the evolution and function of the urban spatial system, and upon the internal spatial structure of an urban area's residential, commercial, and industrial land use. This course also introduces basic concepts and strategies of urban and regional planning with a focus on the domestic realm.

Pre-requisite: GEO 114 Minimum Grade of D or GEO 115 Minimum Grade of D.

**GEO 370 International Tourism 3 cr**

The study of the components of the Tourism industry, their spatial distribution, the environmental and cultural effects of Tourism, and the requisites and techniques for planning tourism development.

Pre-requisite: (GEO 101 Minimum Grade of D or GEO 102 Minimum Grade of D or GEO 114 Minimum Grade of D or GEO 115 Minimum Grade of D).

**GEO 405 Natural Hazards and Disasters 3 cr**

An overview of natural hazards and disasters from a scientific perspective that focuses on the occurrence and impact of environmental hazards, such as volcanoes, earthquakes, tsunamis, floods, mass movements, and coastal hazards. Mitigation techniques used to make the human environment more resilient against natural hazards are also covered. In addition, the viewpoint of hazard and emergency managers toward natural disasters will be studied.

Pre-requisite: GEO 102 Minimum Grade of C or (GY 101 Minimum Grade of C or GY 111 Minimum Grade of C).

**GEO 410 Biogeography 3 cr**

Analysis of spatial patterns of life on earth. Biogeography emphasizes the influence of the physical environment, paleogeography, and past and possible future climate change on the biomes and biogeographic realms.

Pre-requisite: GEO 101 Minimum Grade of D.

**GEO 411 Soils 3 cr**

A review of soil formation, processes and properties (identical to GY 411).

Pre-requisite: GEO 102 Minimum Grade of D.

**GEO 412 Physiograph Regions N Amer-W 3 cr**

The study of the major and minor natural regions of the North American continent, from Alaska to the Mexican border, including the Caribbean area. The course will focus on the different physically defined regions of North America, studying the homogenous variables that make each region distinct, including the topography, vegetation, soils, surface features, and past climates.

Pre-requisite: (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C) and ( (GEO 102 Minimum Grade of C and GEO 102L Minimum Grade of C) or (GY 101 Minimum Grade of C or (GY 111 Minimum Grade of C and GY 111L Minimum Grade of C) ) ).

**GEO 417 Health and Place 3 cr**

This course illustrates how geographic concepts help us better understand health and well-being, through the exploration of theories, methodologies, and contributions of medical geography to the social and health sciences. Using spatial tools, such as mapping and Geographic Information Systems, this course will examine the geographical patterns of health and disease. This course encourages students to examine the theoretical and technological tools geography brings to topics related to health and provides them with a foundation for studying geographic differences in health and health services.

Pre-requisite: EH 102 Minimum Grade of C.

**GEO 435 Research Methods Geography 3 cr**

This course serves as an introduction to geography as a research discipline. Emphasis is placed on geographic problem solving, data collection, data analysis, and reporting. Micro computer oriented statistical and mapping packages will be used to analyze geographic data.

Prerequisites: Junior standing. Core course. Fee.

Pre-requisite: ST 210 Minimum Grade of D. ST 210 can be taken concurrently with this course.

**GEO 440 Coastal Zone Management 2 cr**

A review of ecological features and of management policies for coastal communities with a description of relevant federal and state programs. Taught only at Dauphin Island Sea Lab.

**GEO 441 Coastal Climatology 2 cr**

Study of the controlling factors and features of the world's climates, with particular attention to coastal areas, and application and interpretation of climate data. Taught only at Dauphin Island Sea Lab.

**GEO 443 Climatology-W 3 cr**

Analysis of global climate as aggregate weather. Component elements, factors controlling distribution, resulting area patterns, and climatic classification are studied (identical to MET 443). Fee

Pre-requisite: MET 140 Minimum Grade of C or GEO 101 Minimum Grade of C.

**GEO 475 Field Work in Geography 1 TO 6 cr**

Students will travel to pre-determined location to perform field work for a project that was pre-determined by the professor and student. Once in the field, students will gather data and learn about the landscape(s).

Pre-requisite: EH 102 Minimum Grade of D.

**GEO 485 Seminar in Geographic Thought 3 cr**

This course serves as the capstone course for geography majors in which students integrate their knowledge of human and physical geography, as well as the geographic techniques, to investigate real-world problems with a spatial component. Students gain experience in working in small groups and in written and oral presentation of project results. Students will also lead discussions on key or pertinent research articles in geography. Taught Spring only.

Pre-requisite: GEO 435 and GEO 331 and GEO 332 .

**GEO 490 Special Topics 2 TO 4 cr**

Geographic topics not covered in current geography courses. May be repeated when content varies for a maximum of 8 credit hours.

**GEO 492 Seminar - 1 TO 3 cr**

Departmental seminar investigating a selected field of geography. May be repeated when content varies for a maximum of 3 credit hours.

**GEO 494 Directed Studies 1 TO 4 cr**

Independent research under the direction of a member of the geography faculty. No more than 8 hours of Directed Studies is allowed.

**GEO 496 Internship in Geography 1 TO 4 cr**

On-the-job learning through occupational or professional work with an approved firm or agency. Open to geography majors only. No more than 4 hours of Internship credit is allowed.

**GEO 590 Sp Top - 1 TO 6 cr**

An in-depth course for advanced students in geography. Topics and titles will be selected to examine the subject matter in an area of current interest to students and in an area of particular faculty expertise. Includes specialized topics not currently listed in the Bulletin course offerings.

**GEO 594 Grad Dir Study in Geography- 1 TO 4 cr**

Independent research in Geography at the graduate level. May be used to learn new techniques or explore research questions of special interest under the direction of a member of the Geography graduate faculty.

## Geology (GY)

**GY 111L Physical Geology Lab 1 cr**

Laboratory course for Physical Geology. Fee.  
Co-requisite: GY 111

**GY 112L Earth History Lab 1 cr**

Laboratory course for Earth History.  
Co-requisite: GY 112  
Pre-requisite: GY 111 Minimum Grade of D and GY 111L Minimum Grade of D.

**GY 111 Physical Geology 3 cr**

Materials that make up the Earth as well as the properties and geological processes that operate in the Earth. Special topics include plate tectonics, mineral chemistry, the rock cycle, sedimentary processes, metamorphism and geological map reading. Core course.  
Co-requisite: GY 111L

**GY 112 Earth History 3 cr**

The origin and history of the earth as seen in the rocks and their contained life record. Core Course.  
Co-requisite: GY 112L

**GY 113 Honors Geoscience Field - H 3 cr**

A two-week field course emphasizing the recognition and understanding of geologic processes in the field environment. The course is based in the Taos Ski Valley, New Mexico, with field trips ranging across northern New Mexico and southern Colorado during the interim session. Pre-requisite: (GY 101 Minimum Grade of D or (GY 111 Minimum Grade of D and GY 111L Minimum Grade of S) and (GY 103 Minimum Grade of D or (GY 112 Minimum Grade of D and GY 112L Minimum Grade of S) ).

**GY 301 Geomorphology 3 cr**

Principles of landform development as it relates to specific processes (fluvial erosion, glacial erosion, etc.), construction of topographic base maps with Alidade/Total Station, GPS navigation and surveying, and rock/mineral resource evaluation. Fee.  
Pre-requisite: (GY 101 Minimum Grade of D or GY 111 Minimum Grade of D).

**GY 302 Crystallography and Mineralogy 4 cr**

Introduction to elementary crystallography, crystal chemistry, and atomic structure of minerals, as well as the identification, characterization and use of common rock-forming minerals and important ore minerals. Fee.  
Pre-requisite: (GY 101 Minimum Grade of D or (GY 111 Minimum Grade of D and GY 111L Minimum Grade of D) ) and (GY 103 Minimum Grade of D or (GY 112 Minimum Grade of D and GY 112L Minimum Grade of D) ) and (CH 131 Minimum Grade of D or CH 115 Minimum Grade of D). CH 131 can be taken concurrently with this course.

**GY 303 Igneous & Meta Petrology 4 cr**

The study of the formation and classification of igneous and metamorphic rocks. Fee.  
Pre-requisite: (GY 101 Minimum Grade of D or GY 111 Minimum Grade of D) and (GY 232 Minimum Grade of D or GY 302 Minimum Grade of D or GY 342 Minimum Grade of D).

**GY 304 Stratigraphy - W 3 cr**

The development of the stratigraphic column; correlation and field procedures. Fee.  
Pre-requisite: (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C) and (GY 103 Minimum Grade of D or GY 112 Minimum Grade of D). EH 102 can be taken concurrently with this course.

**GY 305 Geophysics 4 cr**

Application of classical physics to the study of the Earth and the solution of problems in Earth sciences, including analysis of seismic refraction and reflection surveys, earthquakes, gravity and magnetic fields, and electrical geophysical surveys. Fee.  
Pre-requisite: GY 111 Minimum Grade of D and GY 301 Minimum Grade of D.

- GY 306 Sedimentology-W** 3 cr  
Study the principles pertaining to the description and classification of sedimentary rocks, with emphasis on sedimentary processes and depositional environments. Pre-requisite: GY 111 Minimum Grade of D and GY 111L Minimum Grade of D and GY 112 Minimum Grade of D and EH 102 Minimum Grade of C or EH 105 Minimum Grade of C.
- GY 310 Environmental Earth Science** 3 cr  
A spatial perspective on major global environmental problems. Topics include population pressure, loss of biodiversity, ozone depletion, global warming, water, energy and mineral resources, food supplies, waste disposal, geological hazards and political/economic forces (identical to GEO 310). Pre-requisite: GY 111 Minimum Grade of D or GEO 101 Minimum Grade of D or GEO 102 Minimum Grade of D.
- GY 332 Remote Sensing I** 4 cr  
Interpretation of maps, air photos and satellite images (identical to GEO 332). Fee. Pre-requisite: GEO 102 Minimum Grade of C and GEO 102L Minimum Grade of C and GY 301 Minimum Grade of C. GEO 102 and GEO 102L can be taken concurrently with this course.
- GY 401 Paleontology** 3 cr  
Major invertebrate fossil groups, their identification, and their geologic distribution. Fee. Pre-requisite: (GY 103 Minimum Grade of D or (GY 112 Minimum Grade of D and GY 112L Minimum Grade of D) ).
- GY 403 Structural Geology** 4 cr  
Study of the deformation of the internal Earth and the structures that result. Fee. Pre-requisite: (GY 101 Minimum Grade of D or GY 111 Minimum Grade of D) and (GY 301 Minimum Grade of D or GY 325 Minimum Grade of D) and ( (PH 112 Minimum Grade of D or PH 114 Minimum Grade of D) or (PH 201 Minimum Grade of D or PH 216 Minimum Grade of D) ).
- GY 411 Soils** 3 cr  
A review of soil formation, processes and properties (identical to GEO 411). Pre-requisite: (GEO 102 Minimum Grade of D and GEO 102L Minimum Grade of D and GY 301 Minimum Grade of D).
- GY 413 Coastal Geomorphology** 2 cr  
An introduction to coastal sediment processes and their applied coastal geomorphology with emphasis on waves, tides, sediments, and their interactions including the impacts of anthropogenic influences. Taught only at Dauphin Island Sea Lab.
- GY 420 Geostatistics** 3 cr  
Applied bivariate and multivariate statistics to problems in Geography, Geology, and Meteorology; parametric and non-parametric procedures in correlation, regression, analysis of variance, etc. Time series analysis, trend surface analysis, kriging and analysis of spatial (map) data. Identical to GEO 420. Fee. Pre-requisite: (GY 111 Minimum Grade of C and GY 112 Minimum Grade of C) and (MA 112 Minimum Grade of C or ST 210 Minimum Grade of C).
- GY 421 Applied Environ Geology - W** 3 cr  
A geological applications course designed to familiarize students with techniques used by environmental and engineering geologists in their studies of land use, land development and assessment of geological hazards. Material is illustrated with case studies from the Mobile area. Fee. Pre-requisite: (GY 101 Minimum Grade of D or GY 111 Minimum Grade of D) and (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C).
- GY 422 Sedimentary Geology** 3 cr  
A course examining sedimentation with emphasis on environments of deposition, sea-level and other controls on sedimentation in the rock record, and petroleum exploration. Credit for both GY 422 and GY 522 will not be allowed. Fee. Pre-requisite: (GY 101 Minimum Grade of D or GY 111 Minimum Grade of D) and (GY 103 Minimum Grade of D or GY 112 Minimum Grade of D).
- GY 425 Hydrology** 4 cr  
Principles of sources, occurrences, and movement of groundwater. Surface and subsurface investigations of groundwater and elementary groundwater hydrology and chemistry. Credit for both GY 425 and GY 525 will not be allowed. Fee.
- GY 426 Contaminant Hydrogeology** 3 cr  
Flow systems, mass transport in the vadose and saturated zones; advection and dispersion; transformation, retardation and attenuation of solutes; low temperature geochemical processes and kinetics of chemical reactions; contaminant modeling using finite difference-finite element methods. Credit for both GY 426 and GY 526 will not be allowed. Fee. Pre-requisite: (GY 425 Minimum Grade of D or GY 475 Minimum Grade of D).
- GY 431 Optical Mineralogy-Crystallogr** 4 cr  
Theory and use of the petrographic microscope in the recognition and identification of crystallographic and optical properties in non-opaque minerals. Fee. Pre-requisite: (GY 232 Minimum Grade of D or GY 302 Minimum Grade of D or GY 342 Minimum Grade of D).
- GY 433 X-Ray Analytical Methods** 4 cr  
Theory and use of x-ray diffraction systems as applied to crystallography, mineralogy, chemistry, and metallurgy. Fee. Pre-requisite: GY 302 Minimum Grade of D.

- GY 446 Marine Geology** 4 cr  
A study of the geology of the ocean basins, with special emphasis on the continental shelves, their sediments, and sedimentary processes at work there.  
Pre-requisite: (GY 101 Minimum Grade of D or GY 111 Minimum Grade of D) and (GY 103 Minimum Grade of D or GY 112 Minimum Grade of D).
- GY 450 Thin-Section Techniques** 1 cr  
A laboratory based course illustrating techniques employed by geologists to prepare thin-sections from geological materials. Students will produce thin-sections and write up reports detailing the petrography of the samples examined.  
Fee.  
Pre-requisite: (GY 232 Minimum Grade of D or GY 302 Minimum Grade of D or GY 342 Minimum Grade of D) and (GY 233 Minimum Grade of D or GY 303 Minimum Grade of D or GY 343 Minimum Grade of D) and (GY 344 Minimum Grade of D or GY 402 Minimum Grade of D). GY 402 can be taken concurrently with this course.
- GY 480 Field Geology** 6 cr  
A six-week, summer field course on the methods of geologic surveying, the nature and construction of geologic maps and cross-sections, measurements of stratigraphic sections and preparation of geologic reports. This course serves as a capstone class for geology majors.  
Pre-requisite: (GY 303 Minimum Grade of D and GY 403 Minimum Grade of D and GY 402 Minimum Grade of D and HS 170 Minimum Grade of P).
- GY 490 Special Topics** 1 TO 4 cr  
Geological topics not covered in current geology courses.  
Prerequisite: Junior or Senior standing.
- GY 492 Seminar -** 1 TO 3 cr  
Departmental seminar investigating a selected field of geology (topic announced prior to registration). May be repeated when content varies for a maximum of 3 credits
- GY 494 Directed Studies** 1 TO 4 cr  
Independent research in the field or laboratory under the direction of a member of the Geology faculty. Students must have an acceptable project approved before registering for this course. Prerequisite: Permission of the Chair, Junior or Senior standing. No more than 8 hours of directed study is allowed.
- GY 496 Internship in Geology** 1 TO 3 cr  
On-the-job training through occupational or professional work through an approved geological organization. Only open to geology majors. Prerequisite: Permission of chair; Junior or Senior standing. No more than 3 hours of internship is allowed.
- GY 520 Geostatistics** 4 cr  
Applied bivariate and multivariate statistics to problems in Geography, Geology, and Meteorology; parametric and non-parametric procedures in correlation, regression, analysis of variance, etc. Time series analysis, trend surface analysis, kriging and analysis of spatial (map) data. Identical to GEO/GY 420. Credit for both GY 420 and GY 520 will not be allowed.  
Pre-requisite: (ST 175 Minimum Grade of B or ST 210 Minimum Grade of B) or (MA 125 Minimum Grade of C or MA 132 Minimum Grade of C).
- GY 531 Optical Mineralogy-Crystallogr** 4 cr  
Theory and use of the petrographic microscope in the recognition and identification of crystallographic and optical properties in non-opaque minerals. Graduate credit will require an additional project specified by the instructor. Credit for both GY 431 and GY 531 will not be allowed. Fee.  
Pre-requisite: (GY 232 Minimum Grade of D or GY 302 Minimum Grade of D or GY 342 Minimum Grade of D).
- GY 533 X-Ray Analytical Methods** 4 cr  
Theory and use of x-ray diffraction systems as applied to crystallography, mineralogy, chemistry, and metallurgy.  
Pre-requisite: (GY 231 Minimum Grade of D or GY 341 Minimum Grade of D).
- GY 544 Sedimentary Geology** 3 cr  
A study examining sedimentation with emphasis on environments of deposition, sea-level and other controls on sedimentation in the rock record, and petroleum exploration. Credit for both GY 444 and GY 544 will not be allowed.  
Pre-requisite: MAS 603 Minimum Grade of C or GY 344 Minimum Grade of D.
- GY 575 Hydrology** 4 cr  
Principles of sources, occurrences, and movement of ground water. Surface and sub-surface investigations of ground water and elementary ground water hydrology and chemistry.  
Pre-requisite: (GY 232 Minimum Grade of D or GY 342 Minimum Grade of D).
- GY 576 Contaminant Hydrogeology** 4 cr  
Flow systems, mass transport in the vadose and saturated zones; advection and dispersion; transformation, retardation and attenuation of solutes; low temperature geochemical processes and kinetics of chemical reactions; contaminant modeling using finite difference-finite element methods. Credit for both GY 426 and GY 576 will not be allowed. Fee.  
Pre-requisite: GY 425 Minimum Grade of D or GY 475 Minimum Grade of D or GY 575 Minimum Grade of D.
- GY 590 Sp Top -** 1 TO 6 cr  
An in-depth course for advanced students in geology. Topics and titles will be selected to examine the subject matter in an area of current interest to students and in an area of particular faculty expertise. To include specializing topics not currently listed in Bulletin course offerings.



**GY 592 Seminar - 1 TO 6 cr**

Students and faculty meet weekly in an interactive discussion of current literature in geological sciences. The focus will be on 'state of the art' theories and methodologies as they occur in the primary literature. Student presentation is required to receive credit.

**GY 594 Directed Research 1 TO 6 cr**

Independent research under the direction of a member of the graduate faculty. May be used to learn new techniques or to explore research questions of special interest. A maximum of 6 hours may be earned for this course.

**Meteorology (MET)****MET 140L Intro to Meteorology Lab 1 cr**

Laboratory exercises associated with MET 140. Fee. Co-requisite: MET 140

**MET 140 Introduction to Meteorology 3 cr**

This course focuses on introducing the student to the basic concepts of meteorology. Major topics include the structure of our atmosphere, heat balance, meteorological measurements, atmospheric stability, atmospheric motion, and wind circulations on both the global and local scales. Other areas covered may include an introduction to air masses, fronts, and precipitation processes. The analysis of US Government weather charts is also introduced. Core course. Co-requisite: MET 140L

**MET 191 Tropical Weather Discussion 1 cr**

Tropical Weather Discussion is an introductory course in current or recently-active tropical weather systems. This course mainly reviews the structure, behavior, history and potential forecasts of tropical cyclones in the Atlantic, Pacific, and Indian Ocean basins from a meteorological perspective with special emphasis on activity in the Atlantic basin. The course is taught during the Fall Semester because it overlaps with the most active period of the Atlantic Hurricane Season. Other tropical weather topics such as El Nino, La Nina, monsoon troughs, tropical upper-tropospheric troughs, Madden Julian Oscillation, and hurricane climatology are discussed during weeks of inactivity when no tropical cyclones may be occurring. This course may be repeated for credit up to two times for a total of three hours; however, the course may only count once toward a meteorology elective.

**MET 342 Severe Weather 3 cr**

A study of the causes, structure and impact of tornadoes, hurricanes, thunderstorms and severe weather systems (Identical to GEO 342). Pre-requisite: MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C.

**MET 353 General Meteorology 4 cr**

An overall view of the field of meteorology for science majors and minors. This course uses a quantitative approach to study the composition of the atmosphere, atmospheric processes, global circulation, and storm development. Laboratory exercises pay particular attention to hands-on analysis of meteorological charts (identical to GEO 353.) Fee.

Pre-requisite: (MET 140 Minimum Grade of D and MET 140L Minimum Grade of D) and ( MA 112 Minimum Grade of C or MA 171 Minimum Grade of C) or (MA 113 Minimum Grade of C or MA 172 Minimum Grade of C) or (MA 125 Minimum Grade of C or MA 132 Minimum Grade of C) ).

**MET 354 Dynamic Meteorology I 3 cr**

Dynamic meteorology is the study of atmospheric motions that control our weather and climate. Using fundamental laws of physics (fluid dynamics and thermodynamics), a set of mathematical equations that describe how the atmosphere behaves, is derived. These equations are too complex to solve analytically, but with certain assumptions they can be simplified so that approximate solutions can be found. Even though approximate, these solutions still give useful information about the current state of the atmosphere and its evolution into the future. The theories derived in dynamic meteorology underlie all forecasting rules and techniques. Thorough understanding of these theories is invaluable to becoming a skilled forecaster.

Pre-requisite: (MA 126 Minimum Grade of C or MA 233 Minimum Grade of C) and (PH 201 Minimum Grade of C or PH 216 Minimum Grade of C).

**MET 355 Dynamic Meteorology II 3 cr**

The circulation of the atmosphere and the structure of storms is quantitatively analyzed using equations of atmospheric flow. The jet stream, atmospheric waves, mid-latitude cyclones, and the concept of vorticity are given considerable attention.

Pre-requisite: MET 354 Minimum Grade of C or GEO 344 Minimum Grade of C or GEO 354 Minimum Grade of C.

**MET 356 Physical Meteorology 3 cr**

A detailed investigation of adiabatic processes, thermodynamic diagrams, atmospheric stability, and precipitation processes. Additional topics include atmospheric composition and aerosols, radiation and electricity.

Pre-requisite: (MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C) and (MA 126 Minimum Grade of C or MA 233 Minimum Grade of C) and (PH 201 Minimum Grade of C or PH 216 Minimum Grade of C). MET 353 and GEO 353 and MA 126 and MA 233 and PH 201 and PH 216 can be taken concurrently with this course.

- MET 357 Meteorological Instrumentation** 2 cr  
Design, calibration, use and maintenance of existing and newly developed meteorological instruments and instrumentation systems. Analysis of data collected by instruments and instrument systems.  
Pre-requisite: (MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C).
- MET 358 Radar Meteorology** 4 cr  
This course is designed to give the student a three-fold introduction to weather radar and its value in the workplace. Basic radar principles and assumptions applicable to all radars are presented; the Doppler function and limitations are covered in depth with final emphasis on properly utilizing weather radar in an operations setting.  
Pre-requisite: (MET 354 Minimum Grade of C or GEO 344 Minimum Grade of C or GEO 354 Minimum Grade of C) and (PH 202 Minimum Grade of C or PH 217 Minimum Grade of C).
- MET 359 Introduction to TV Weather** 2 cr  
This course gives the students the basic skills necessary for broadcasting weather information on TV. This course will focus on the basic principles and techniques of effective TV weather broadcasting.  
Pre-requisite: (MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C).
- MET 360 Atmospheric Analysis** 1 cr  
Analysis of meteorological charts. Provides additional preparation prior to Synoptic. Fee.  
Pre-requisite: (MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C) and (MET 354 Minimum Grade of C or GEO 344 Minimum Grade of C or GEO 354 Minimum Grade of C).
- MET 370 Satellite Meteorology** 3 cr  
This course is an introduction to the weather satellite and its influence on meteorological observations and forecasting. Both radiative propagation theory and satellite interpretation of meteorological features will be covered extensively.  
Pre-requisite: MET 356 Minimum Grade of C and (PH 202 Minimum Grade of C or PH 217 Minimum Grade of C).
- MET 401 Weather Forecasting I** 2 cr  
A course specifically designed for students minoring in Meteorology. Students are introduced to weather forecasting concepts and methods.  
Pre-requisite: (MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C).
- MET 402 Weather Forecasting II** 2 cr  
A course specifically designed for students minoring in Meteorology. Weather forecasting techniques are discussed with an emphasis on the use of meteorological models and severe weather forecasting.  
Pre-requisite: MET 401 Minimum Grade of C.
- MET 410 MET Phenomenology - W** 3 cr  
This class is an introduction to reading meteorological journal and professional writings and to writing some of the standard scientific forms common in both operational and research meteorology: summaries, conference abstracts, and scientific journal articles. The students will engage in brief examination of some of the fundamental phenomena in the atmosphere through selected journal articles and write about these topics in an appropriate manner as inquisitive meteorologists.  
Pre-requisite: (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C) and (MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C) and ( (MET 354 Minimum Grade of C or GEO 344 Minimum Grade of C or GEO 354 Minimum Grade of C) or MET 401 Minimum Grade of C).
- MET 420 Computer Apps in Earth Science** 4 cr  
An introduction to basic Python programming, with examples and exercises pertinent to Earth Science and GIS applications.  
Pre-requisite: MA 112 Minimum Grade of D or MA 110 Minimum Grade of C.
- MET 430 Mesoscale Meteorology** 3 cr  
Assessment of mesoscale phenomena, including frontogenesis and frontolysis, low-level jet streams, nocturnal boundary layer wind maxima, sea and land breezes, gravity waves, dry lines, lake-effect snow, and deep moist convection. Emphasis on scale analysis, subsynoptic-scale dynamics, interactions with larger-scale processes, and case study examples.  
Pre-requisite: (MET 355 Minimum Grade of C or GEO 345 Minimum Grade of C or GEO 355 Minimum Grade of C).
- MET 440 Air Pollution Meteorology** 2 cr  
Air Pollution Meteorology is a survey course in air pollution topics taught primarily from an atmospheric perspective. This course covers topics on air pollution history, methods of measuring air quality, sources of air pollution, basic atmospheric pollution dispersion concepts, basic principles of air pollution modeling and prediction, and an overview of the impacts of polluted air on human health and the environment.  
Pre-requisite: MET 140 Minimum Grade of C or GEO 101 Minimum Grade of C and MA 110 Minimum Grade of C.
- MET 442 Tropical Meteorology** 2 cr  
This course presents an overview of meteorology in the tropics. The tropical realm is defined and the importance of solar radiation and distribution of temperature, moisture and precipitation in driving tropical weather systems is discussed. The general circulation in the tropics is explored along with seasonal and non-seasonal variations, including the Monsoon and El Nino/La Nina. Certain mesoscale and local circulations common to the tropics are also discussed. Several weeks will be spent investigating tropical cyclones.  
Pre-requisite: MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C.

- MET 443 Climatology - W** 3 cr  
Analysis of global climate as aggregate weather. Component elements, factors controlling distribution, resulting area patterns, and climatic classification are studied (identical to GEO 443). Fee  
Pre-requisite: MET 140 Minimum Grade of C or GEO 101 Minimum Grade of C.
- MET 454 Synoptic Meteorology I** 6 cr  
Principles of dynamic and physical meteorology are applied to current surface and upper air analyses of frontal cyclones. An emphasis is placed on forecasting techniques, daily weather discussions, continuity and analysis.  
Pre-requisite: MET 355 Minimum Grade of C and MET 356 Minimum Grade of C.
- MET 455 Synoptic Meteorology II** 6 cr  
This course continues the development of principles learned in MET 454. Principles of atmospheric dynamics and conceptual models will be studied and employed through the use of surface and upper air analyses, satellite and radar data. A multi-week overview of numerical weather prediction principles and concepts will be accomplished along with the integration and interpretation of model guidance of actual modeling simulations using basic concepts of numerical weather prediction. Topics on mid-latitude cyclones and fronts will continue to be expanded beyond Synoptic I. Ensemble prediction and atmospheric oscillations will be discussed along with intrinsic predictability limitations. This course serves as the capstone class for meteorology majors.  
Pre-requisite: MET 454 Minimum Grade of C.
- MET 456 Applied Climatology - W** 3 cr  
Training in the application of climatology to solve real world problems. In addition to an examination of present day climate patterns, their causes, and mechanisms, the course focuses on the El Nino, recent and past climates, the natural and human impact on the Earth's energy balance, global warming, ozone hole and the chaos theory.  
Pre-requisite: (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C) and (MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C) and (MET 341 Minimum Grade of C or GEO 341 Minimum Grade of C). EH 102 and MET 353 can be taken concurrently with this course.
- MET 490 Sp Top -** 1 TO 4 cr  
Meteorological topics not covered in current meteorology courses. May be repeated when content varies for a maximum of four hours. May require permission of instructor.
- MET 492 Seminar -** 1 TO 4 cr  
Departmental seminar investigating a special field of meteorology. (Topic announced prior to registration.) May be repeated when content varies for a maximum of eight hours. Requires permission of instructor.
- MET 494 Directed Studies** 1 TO 4 cr  
Independent research in field, laboratory, or library under the direction of a member of the meteorology faculty.  
Prerequisite: Requires permission of instructor. May be taken for a total of eight hours.
- MET 495 Mesonet Internship** 1 cr  
Students will learn various aspects of mesonet (mesoscale weather station network) operation and maintenance. Students will take part in routine weather station site visits, emergency site visits when a sensor malfunctions, and quality control of incoming data. Once a year every weather station receives a complete retrofit where all sensors are replaced with freshly calibrated sensors. If such a retrofit occurs during the semester of a student's internship, the student will be given the opportunity to take part in this process as well. A large component of this course will consist of field work. Depending on student schedules and mesonet behavior, time will also be spent in the lab performing manual data quality control using the USA Mesonet website.  
Pre-requisite: (MET 353 Minimum Grade of C or GEO 353 Minimum Grade of C).
- MET 496 Internship in Meteorology** 1 TO 3 cr  
On-the-job learning through occupational, professional, or research work with an approved firm, agency, or meteorology faculty member. Open only to meteorology majors. Prerequisite: Permission of department chair.
- MET 497 Broadcast Meteorology Pract I** 3 cr  
This course focuses on introducing the student to the ever evolving technology in broadcast meteorology. Emphasis is placed on the application of meteorological data through the use of professional television weather graphics systems in order to develop a "weather story". Particular attention is given to the use of chroma key mechanics/techniques for public viewing.  
Pre-requisite: MET 359 Minimum Grade of C.
- MET 498 Broadcast Meteorology Prac II** 3 cr  
This course focuses on communicating accurate forecasts and other important weather information to the public. Attention is given to fine-tuning the on-air weather presentation style, as well as developing a professional resume tape of weather shows in order to gain employment as a broadcast meteorologist. Special attention is given to severe weather cut-ins and accurately conveying severe weather threats to the public.  
Pre-requisite: (MET 355 Minimum Grade of C or GEO 345 Minimum Grade of C or GEO 355 Minimum Grade of C) and MET 497 Minimum Grade of C. MET 355 can be taken concurrently with this course.

**MET 540 Topics in Air Pollution MET 3 cr**

Topics in Air Pollution Meteorology is a graduate course on advanced air pollution topics taught primarily from an atmospheric perspective. This course provides an overview of "dry" meteorological processes, such as temperature, pressure, wind, and general circulation combined with topics on air pollution history, methods of measuring air quality, sources of air pollution, atmospheric pollution dispersion concepts, principles of air pollution modeling and prediction, and the impacts of polluted air on human health and the environment.

**MET 590 Meteorology 1 TO 6 cr**

An in-depth course for advanced students in meteorology. Topics and titles will be selected to examine the subject matter in an area of current interest to students and in an area of particular faculty expertise. Includes specialized topics not currently listed in the Bulletin.

**MET 594 Grad Dir St in Meteorology- 1 TO 4 cr**

Graduate level independent study in Meteorology under the direction of a member of Meteorology's Graduate Faculty. Student must have an approved topic and must be accepted by a Graduate Faculty mentor before registering for this class. Prerequisite: Graduate standing.

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## Faculty

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