Coastal Environmental Studies (COS)

Major and minor in Coastal Environmental Studies

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Coastal Environmental Studies
The Coastal Environmental Studies major, leading to a Bachelor of Science degree, provides the skills, knowledge, and preparation for students to assess and address coastal environmental problems. The curriculum integrates principles and methodologies from physical sciences, natural sciences, and physical geography, combined with an understanding of environmental ethics, environmental policy, and environmental law.

The major prepares students for entry-level employment in the public, private, or non-profit sectors concerned with assessment, abatement, or regulation of a wide range of coastal environmental problems. The major prepares students for graduate study in environmental science, marine science, geoscience, environmental planning and related fields.

Coastal zones have always concentrated people and economic activities because of their natural resources and trading opportunities. Many of the world's largest cities are on seacoasts and at the mouths of the great rivers. The development of coastal zones around the world has created an array of environmental problems and water and land resource issues, further complicated by sea level rise.

Students will enroll in major-specific courses in their junior and senior year. As part of the degree requirements, students will work in teams with students enrolled in related majors to solve problems collaboratively. Students are encouraged to take advantage of independent research opportunities, internships, and field camps to gain real-world experience.

Requirements for the Major and Minor Coastal Environmental Studies (COS)

Requirements for the Major in Coastal Environmental Studies (COS)

A. Required Foundation Courses for Major (34-35 credits)

- MAT 131 or MAT 125/MAT 126. If students do not place into MAT 125 or 131 on the basis of the math placement examination, MAT 123 is a required course for the major.
- CHE 131/CHE 133 and CHE 132
- SBC 111 Introduction to Sustainability
- SBC 113/SBC 114 Physical Geography
- SBC 201 Systems and Models
- AMS 102 Elements of Statistics
- SBC 205 Introduction to Geospatial Analysis
- BIO 201 Fundamentals of Biology
- BIO 204 Fundamentals of Scientific Inquiry in the Biological Sciences
- ENS 119 Physics for Environmental Studies

B. Career and Leadership Skills

- CSK 102 Career Leadership Skills: Working in Teams
- CSK 302 Technical Writing and Communication
- Two courses selected from CSK 101, 103-109 (1 credit each)

C. Core Courses

- MAR 333 Coastal Oceanography
- ENV 315 Coastal Groundwater Hydrology
- ENV 316 Coastal Zone Management
- GSS 313 GIS Design and Applications I
- GSS 314 GIS Laboratory (for students enrolling in GSS 313 Spring 2013 or later)
- ENV 320/ENV 321 Chemistry for Environmental Scientists

Students are required to select 9 credits from group A and 3 credits from group B.

Group A: Environmental Science Electives (choose 9 credits)
- BIO 351 Ecology
- BIO 352 Ecology Laboratory
- EDP 305 Risk Assessment and Sustainable Development
- ENV 304 Global Environmental Change
- ENV 340 Contemporary Topics in Environmental Science
- ENV 317 Coastal Pond Algal Ecology
- ENV 487 Research in Environmental Science
- ENV 405 Field Camp
- MAR 303 Long Island Marine Habitats
- MAR 304 Waves, Tides, and Beaches
- MAR 315 Conservation Biology and Marine Biodiversity
- MAR 336 Marine Pollution
- MAR 388 Tropical Marine Ecology
- EHI 310 Restoration Ecology

Group B: Environment, Society, and Policy (choose 3 credits)

- SUS 341 Environmental Treatises and Protocols
- SBC 307 Environmental History of North America
- SBC 309 Global Environmental Politics
- SUS 342 Energy and Mineral Resources
- EHI 340 Ecological and Social Dimensions of Disease

One of the following courses may also be used to substitute for any of the courses in Group B, however, each of the courses below has a prerequisite outside the major.

- EDP 301 The Built Environment I
- EDP 309 Planning: Policies and Regulations
- SBC 330 Extreme Events
- SBC 308 American Environmental Politics
- SBC 312 Environment, Society, and Health
- SUS 301 Environmental Ethics
- SUS 303 Demographic Change and Sustainability
- SBC 311 Disasters and Society: A Global Perspective

D. Systems Course (3 credits)

One Integrative, Collaborative Systems Project course:

- GEO 301 Sustainability of the Long Island Pine Barrens
- SBC 401 Integrative, Collaborative Systems Project
- With permission of the Program Director, a student may take SBC 488 Internship in lieu of a systems course.

E. Upper-Division Writing Requirement

Proficiency in writing, oral communication, and computer literacy will be encouraged in all students. In addition to CSK 302, these skills will be developed within the context of other formal coursework and no additional credits are required. To meet the upper-division writing requirement, students must submit two papers from any 300-level or 400-level course in the major to the Director of the COS Undergraduate Program.

Students should consult with the department advisor to ensure that their plan for completing the Upper Division Writing Requirement is consistent with university graduation requirements for General Education. Students completing the Stony Brook Curriculum (SBC) must complete a course that satisfies the "Write Effectively within One's Discipline" (WRTD) learning objective to graduate. The Upper Division Writing Requirement is consistent in most cases with the SBC learning outcomes for WRTD.

Note: One course passed with a C- may be applied to the major; all other courses offered for the major must be passed with a letter grade of C or higher. Course taken with the Pass/NC option may not be applied to the major.

Requirements for the Minor in Coastal Environmental Studies (COS)

The Coastal Environmental Sciences minor is intended to provide a coherent foundation of scientific study on the physical processes and interactions of the coastal zone environment.

**Requirements for the Minor in Coastal Environmental Studies (COS):**

- No more than two courses that are used to satisfy major requirements may be applied to this minor.
- No more than one three-credit course in the minor may be taken under the Pass/No Credit option.
- All upper-division courses offered for the minor must be passed with a letter grade of C or higher.
- Completion of the minor requires 22 to 23 credits.
Required two introductory courses (6-7 credits):

- MAT 125 or MAT 131 Calculus and
- SBC 113 Physical Geography or GEO 102 The Earth

Required advanced courses (10 credits):

- ENV 316 Coastal Zone Management
- GSS 313 GIS Design and Applications I
- GSS 314 GIS Laboratory (for students enrolling in GSS 313 Spring 2013 or later)
- MAR 333 Coastal Oceanography

Required two advanced elective courses chosen from the following, for a minimum of 6 credits:

- BIO 351 Ecology
- EHI 310 Restoration Ecology
- ENV 304 Global Environmental Change
- ENV 340 Contemporary Topics in Environmental Science
- ENV 317 Coastal Pond Algal Ecology
- ENV 487 Research in Environmental Science
- GSS 325 GIS Design and Applications II
- MAR 303 Long Island Marine Habitats
- MAR 304 Waves, Tides, and Beaches
- MAR 336 Marine Pollution
- SBC 309 Global Environmental Politics or SBC 307 Environmental History of North America

Declaration of the Minor To progress efficiently through the minor, students should declare the minor in Coastal Environmental Studies no later than the middle of their sophomore year, at which time they should consult with the minor coordinator or undergraduate director and plan their course of study for fulfillment of the requirements.

Sample Course Sequence for the Major in Coastal Environmental Studies

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ENV

Environmental Science

ENV 115: Chemistry, Life, and Environment
This survey course introduces chemical principles by emphasizing the role chemistry plays in everyday life, the natural environment, the built environment, energy production, and in processes leading to environmental degradation. In addition, the role of chemistry in the development of alternative energy sources, remediation technologies, and eco-friendly products is discussed. This course for non-science majors introduces chemical principles using mostly qualitative approaches rather than quantitative approaches. Interactive tools and interactive visualization tools are extensively used to illustrate concepts, reactions, and processes. This course is offered as both CHE 115 and ENV 115.

DEC: H
SBC: SNW
3 credits

ENV 301: Sustainability of the Long Island Pine Barrens
The ecologically diverse Long Island Pine Barrens region provides a habitat for a large number of rare and endangered species, but faces challenges associated with protection of a natural ecosystem that lies in close proximity to an economically vibrant urban area that exerts intense development pressure. In this course we will consider the interaction of the ecological, developmental and economic factors that impact the Pine Barrens and the effectiveness of decision support systems in promoting sustainability of the Pine Barrens. This course is offered as BIO 301, GEO 301, ECO 301, ENV 301, and ESG 301.

Prerequisites: U3 or U4 status and one of the following: BIO 201, CHE 131, ECO 108, ESG 100, ESG 198, GEO 101, GEO 102

DEC: H
SBC: STAS
3 credits

ENV 310: Sustainability and Renewable Energy - Costa Rica
Hands on experience in Costa Rica to learn and see the countries efforts for environmental sustainability and renewable energy. Students will spend 12 days in Costa Rica to participate in site visits to five renewable energy facilities and four environmental sustainability efforts. This in-depth experience is supported with topic-specific lectures, online readings and assignments, and work on an interdisciplinary capstone project. Students will also collaborate with local engineers on a community service project to provide the local communities with accessible water or other sustainability initiatives.

Prerequisite: Permission of the instructor

DEC: H
SBC: STAS
4 credits

ENV 315: Principles and Applications of Groundwater Hydrology
Principles of groundwater hydrology. Aquifer geology, with an emphasis on coastal ground water systems and Long Island in particular. Introduction to quantitative numerical methods to simulate regional groundwater flow and contaminant transport in aquifers.

Development and management of freshwater aquifers as drinking water resources.

Prerequisites: MAT 126 or MAT 131; ENS 119 or GEO 102 or SBC 113

DEC: H
SBC: STAS
3 credits

ENV 316: Coastal Zone Management
Coastal zones are dynamic environments shaped by natural forces as well as human intervention. Developing management strategies is critical and requires an understanding of the coastal zones environments, the threats to these environments, as well as the applicable laws and policies. This course examines past and present coastal zone management strategies at the national, regional, and local level. Coastal zone management on Long Island will be extensively reviewed and discussed.

Prerequisite: ENS 101 or SBC 111 or SBC 113 or GEO 102 or POL 102 or MAR 104; U3 or U4 status
3 credits

ENV 317: Ecology of Algae and Plants of Coastal Plains Freshwater Habitats
An introduction to the ecology of algae and aquatic plants of Long Island's freshwater habitats. Specific focus is on the lakes and ponds, rivers and streams, and wetlands (bogs, swamps, and marshes) of the coastal plains. Emphasis is on natural ecology, biodiversity, and water quality. Subject matter includes the major functional groups of algae and aquatic plants, taxonomic identification skills, aquatic field and lab methods, water quality analyses, and data analysis.

Prerequisite: BIO 201; CHE 131 or ENV 115

SBC: STEM+
3 credits

ENV 320: Chemistry for Environmental Scientists
Course designed to provide a firm understanding of the chemical principals and reactions of importance in environmental degradation of natural environments or built environments, remediation and abatement processes, energy production. In addition, the course reviews the chemical processes that control the transport, fate, and bioavailability of common organic pollutants, metals, and metalloids. The course expands on concepts from general chemistry, and introduces concepts from physical chemistry, analytical chemistry, organic chemistry, photochemistry, and geochemistry. Not for credit in addition to CHE 310.

Prerequisite: CHE 132 or CHE 142

DEC: H
SBC: STAS
3 credits

ENV 321: Chemistry for Environmental Scientists-Lab
Laboratory course is designed to illustrate principles, processes, and reactions presented in ENV 320. In addition, the laboratory will focus on the quantitative analysis and identification of common chemical pollutants, including common volatile and semi-volatile organics, metals and metalloids. Some of the laboratory meetings will be in the form of short field trips to practice sampling techniques as well as in situ and on site analysis techniques.

Prerequisite: CHE 133
Pre- or corequisite: ENV 320 or CHE 310
1 credit
ENV 340: Contemporary Topics in Environmental Science
Course explores one or more contemporary environmental science topics in depth. Topic(s) vary by semester. Examples of topics include: formation and fate of Asian Brown Cloud; Arsenic in Drinking water; Acid Rain; Environmental issues related to mining; Environmental impact of burning and mining coal; Pesticides and Herbicides in the Environment. Course may be repeated once. **Prerequisite:** U3/U4; ENV 115 or CHE 131  
**SBC:** ESI, STEM  
3 credits

ENV 405: Field Camp
A field course in environmental science of closely related field that may be taken at any one of several approved university programs. Student should plan in consultation with Undergraduate Program Director.  
**Prerequisite:** U3/U4 standing  
1-6 credits, S/U grading

ENV 447: Readings in Environmental Sciences
Tutorial readings in the environmental science. May be repeated.  
1-2 credits, S/U grading

ENV 487: Research in Environmental Sciences
Qualified advanced undergraduates may carry out individual research projects under the direct supervision of a faculty member. May be repeated.  
Prerequisite: Permission of instructor  
**SBC:** EXP+  
0-6 credits, S/U grading

**SBC**

**Sustainability Block Curriculum**

**SBC 113: Physical Geography Lecture**
This study of ecosystems examines modern environmental problems through quantitative methods, analysis, and modeling grounded in basic and applied science and research. The goal of the course is to introduce students to the fundamental processes that dominate the atmosphere, hydrosphere, lithosphere, and biosphere, their characteristics and complex interactions, and their impact on human life and society.  
**DEC:** E  
**SBC:** SNW  
3 credits

**SBC 114: Physical Geography Lab**
This laboratory course provides hands on experience in understanding the ecosystems, including distribution and interrelationships of climate, vegetation, soils, and landforms.  
**Pre- or corequisite:** SBC 113  
1 credit

**SBC 115: Introduction to Human Demography**
An introductory course on the study of human population. Measurement issues and data in demographic analysis, as well as demographic perspectives on the basis of a review of major sources of information about population studies will be presented. Theories incorporating social, economic and political explanations for influences on human population growth will be considered. Population processes, with focus on fertility, mortality and migration, are reviewed. Population structure and characteristics, the interaction of the population processes and the number of people in a society of a given age, sex, race, ethnicity, socioeconomic levels, marital status, and gender, are reviewed. Major issues related to sustainability (such as economic development, food and pollution, urbanization, gender and minority empowerment, and the human relationship and ecology with other organisms and species) are reviewed.  
Prerequisite: MAT 125, MAT 131, MAT 132, or level 6 or higher on math placement exam  
**SBC:** SBS  
3 credits

**SBC 116: Introduction to Human Geography**
Survey course introduces geography as a social science by emphasizing the relevance of geographic concepts to human problems.  
**Prerequisite:** AMS 151 or MAT 125 or MAT 131 or MAT 141  
Course emphasizes globalization and cultural diversity.  
**DEC:** F  
**SBC:** SBS  
3 credits

**SBC 117: Design Drawing**
This introductory course exposes the student to the fundamental theories and practices employed in visually representing design concepts from observational through technical and speculative drawing. The course content introduces the student to contour drawing, rendering, orthographic projection, and pictorial drawing. Project work engages the student in the application of the above-mentioned drawing techniques and develops skills through the solution of student tailored problems.  
**DEC:** D  
**SBC:** TECH  
3 credits

**SBC 200: Human Settlement: History and Future**
The history of city growth over the millennia as affected by technological change is a basis for understanding the future of human settlement. More than half of the world's population currently lives in cities and urbanization continues on a global scale. The universality of urban development and resulting patterns will be presented as well as limits on growth of cities. Architectonic and socioeconomic planning theories and strategies for sustainable growth are presented. The development of Long Island, which is a microcosm of national and global patterns, will be discussed in detail.  
**DEC:** F  
**SBC:** SBS  
3 credits

**SBC 201: Systems and Models**
Introduction to the dynamic modeling of complex systems. Students will learn to use simulation software that facilitates the visualization, formulation, and analysis of systems. Students will learn about systems with positive and negative feedbacks, the effects lags on system performance, and the difference between stocks and flows. Systems studied will include ecological models, economic models, chemical models, population models, epidemiological models, and models that include the interactions between population, economic development, and the environment.  
**Prerequisite:** AMS 151 or MAT 125 or MAT 131 or MAT 141  
3 credits
1 credit

**SBC 203: Interpretation and Critical Analysis**

An introduction to interdisciplinary inquiry and representation in arts, culture, and theory with emphasis on the roles of analysis, argument, and imagination in multiple media. Requires serious engagement with sophisticated texts.

*Pre- or corequisite: WRT 102*

**DEC:** C

**SBC:** CER, HUM, WRTD

3 credits

**SBC 204: Population Studies**

The course will present basic mathematics of population growth and introduce various approaches for modeling populations, including population viability analysis (PVA). PVA, the quantitative assessment of the extinction risk of rare species or populations, takes biological information (habitat requirements, birth and death rates, population size) and makes predictions about future population sizes. Real examples will be discussed for a range of organisms, from bacteria to plants and mammals. This course will provide also the background for understanding human population growth. The impacts of human population growth in the developed and developing world on the ecology of other organisms, habitats and systems will also be discussed.

*Prerequisite: MAT 125*

**DEC:** E

**SBC:** STEM+

3 credits

**SBC 205: Introduction to Geospatial Analysis (lab course)**

Introduction to geographic information systems (GIS) and remote sensing techniques as applied to documenting, mapping, analyzing, interpreting, and managing natural and cultural resources. Overview of types of GIS data, computer hardware and software used for geospatial analysis, basic cartography, and global positioning system (GPS).

1 credit

**SBC 206: Economics and Sustainability**

Introduction to the basic economic concepts used in sustainability analysis. Students will learn the basic concepts and how to apply them in various context. Topics include the analysis of situations in which the behavior of individuals indirectly affects the well-being of others, strategic behavior and the environment, and the use of market-oriented policies to help in the stewardship of the environment.

*Prerequisite: ECO 108*

**DEC:** F

**SBC:** SBS+

3 credits

**SBC 307: American Environmental History**

This course provides an overview of the history of how Americans have used, viewed and valued the natural environment. Beginning with the Indians and the early colonists (15th-16th centuries), the course will examine the cultural, social, economic, political, and technological currents that shaped North Americans' relationships with their environment in early and later industrial eras, after World War II, and finally, in the late 20th and early 21st centuries. Historical snapshots will center on people living in more natural places, such as farms and forests, as well as more built places, such as factories, cities, and suburbs. Events in the northeastern U.S. will provide a geographic focus, but the course will also look at related happenings elsewhere on the North American continent and beyond. Finally, it will examine at the growing array of movements that have identified themselves as ‘environmental,’ at the ‘greenness’ of modern culture, and at the environmental dimensions of a globalizing era.

*Prerequisite: U3/U4 standing*

**DEC:** K & 4

3 credits

**SBC 308: American Environmental Politics**

This course will survey the politics of environmental policy-making in the United States. It examines how contrasting political, economic and social interests and values have clashed and contested with one another, and the exerted power, in the environmental policy realm. The course will explore past precedents and roots, but with a view to explain the shape of this realm in the modern United States, including the many actors and institutions: local, regional and national governments, non-governmental organizations and interest groups, as well as the public. It will look at the main patterns by which these groups have defined environmental problems and formulated and implemented solutions. A chief goal is to illuminate how and why solutions of real-world environmental problems, if they are to be effective, differ from those of scientific or engineering puzzles.

*Prerequisite: POL 102*

**DEC:** K

3 credits

**SBC 309: Global Environmental Politics**

This course will explore the politics of environmental policy-making within the international realm. Focused especially on environmental dilemmas that cross national boundaries (i.e., pollution), or that are shared by multiple nations (i.e., global warming) it will look at the ways that such problems have been defined and their solutions sought, both with and without an over-arching state or governance. It will survey the many groups, interests and values that have clashed and competed with one another to exert power and influence international environmental policies, as well as the variety of international institutions and agreements that have sought to formulate and implement solutions. One goal is to illuminate how and why effective solutions to global environmental problems differ from those to scientific or engineering puzzles. The course also aims to spur student engagement with the sometimes overwhelming nature of global environmental threats, the tenuous and sometimes counterproductive ways that knowledge and power can be linked, and the ways individuals may act powerfully in service of “sustainability.”

*Prerequisite: SBC 111 or ENV 115 or ENS 101 or GEO 101 or permission of instructor*

**SBC:** GLO

3 credits

**SBC 310: Migration, Development and Population Redistribution**

This course draws upon the contributions of various social and natural sciences (including population and urban geography, demography, political science, sociology, history, economics, public health and environmental sciences) to explore the effects of migratory and demographic shifts on the environment, social welfare, public health, economic development, ethnic diversity, urbanization, public policy and planning. It will examine the political, social, environmental, health and economic effects on sustainability.

*Prerequisite: SBC 115*

3 credits

**SBC 311: Disasters and Society: A Global Perspective**

This class introduces students to the sociological examination of natural, technological, and industrial disasters. Students will explore how and why disasters are fundamentally social events: What do disasters reveal about society? Why are the human consequences of disasters unequally
distributed? What are the typical ways in which states, organizations, and communities respond to disasters? Focusing on case studies from around the world, students will discuss: What are the long-term/short-term causes of particular disasters? What forms of suffering the disasters under consideration generated? What state/civil society actions did they trigger? What advocacy networks were put in place in their aftermath?  

Prerequisite: SBC 111, or ENS 101, or GEO 101; POL 102 or SOC 105  
DEC: H  
SBC: STAS  
3 credits

SBC 312: Environment, Society, and Health  
This class examines the interactions between environment, social structures, and institutions. The first part of the class examines the ways in which environmental issues are perceived and constructed by various social actors (lay public, state officials, scientists, activists, media). The second part of the class will examine the differential impact of class, race, and gender on the distribution of hazards and risks (what is commonly known as 'environmental inequality'). In the third part of the class, students will be introduced to different cases of 'contested environmental illnesses' (cancer, lead-poisoning, asthma).  

Prerequisite: SBC 111, or ENS 101, or GEO 101; POL 102 or SOC 105  
DEC: F  
SBC: SBS+  
3 credits

SBC 320: Sub-Saharan Africa: Geography, Cultures, and Societies  
This course presents a broad perspective on Sub-Saharan Africa, a region of sharp geographic, cultural, and economic contrasts. The legacy of the region's triple heritage (indigenous, Islamic, and European) is presented as a framework for understanding the complexity and diversity of contemporary Sub-Saharan Africa in terms of distribution of languages, religions, ethnicity, family relations, and governance systems. The influence of globalization, migration, HIV/AIDS, conflicts, population growth, and socioeconomic development policies on modern Sub-Saharan African are discussed.  

Prerequisite: Junior or Senior Standing  
DEC: J  
SBC: SBS+  
3 credits

SBC 321: Ecology and Evolution in American Literature  
This course is a review of 19th- and 20th-century American writers who trace the evolution of the US with respect to ecological practices through various multicultural perspectives. Literature covered will include transcendentalist essays, utopian/dystopian novels, ecofeminist fiction, and journalism.  

Prerequisite: SBC 203 or EGL 204  
DEC: G  
SBC: HFA+, WRTD  
3 credits

SBC 325: Environmental Writing and the Media  
An examination of multiple genres (including: photo journalism, literary nonfiction, fine art and advertising and documentary film) in order to understand ways in which these genres are utilized to inform and manipulate public opinion regarding the environment. The culmination of the course will be a final project using multiple genres.  

Prerequisite: WRT 102  
Advisory Prerequisite: SBC 203  
DEC: G  
SBC: HFA+, WRTD  
3 credits

SBC 326: Undergraduate Teaching Practicum II  
Work with a faculty member as assistant in a regularly scheduled course. The student must attend all classes and carry out all assignments; in addition the student will be assigned a specific role to assist in teaching the course. The student will meet with the instructor on a regular basis to discuss intellectual and pedagogical matters relating to the course.  

Prerequisites: Permission of instructor and undergraduate director  
SBC: ESI, EXP+  
3 credits, S/U grading

SBC 401: Integrative, Collaborative Systems Studies  
Problem-based capstone course.  
Prerequisite: U3 or U4 status  
SBC: ESI  
3 credits

SBC 475: Undergraduate Teaching Practicum  
Work with a faculty member as assistant in a regularly scheduled course. Students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have already been graded. Students may not serve as teaching assistants in the same course twice.  

Prerequisites: Permission of instructor and undergraduate director  
SBC: EXP+  
3 credits, S/U grading

SBC 476: Undergraduate Teaching Practicum II  
Work with a faculty member as assistant in one of the faculty member's regularly scheduled courses. Students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have already been graded. Students may not serve as teaching assistants in the same course twice.  

Prerequisites: Permission of instructor and undergraduate director  
SBC: EXP+  
3 credits, S/U grading

GSS 105: Introduction to Maps and Mapping  
An introduction to the study and design of map formats, symbology, coordinate systems, and how maps record the historical patterns of human behavior. The course will also examine maps as a tool to analyze human activity and societal development, and include important aspects of map data collection,
processing, the Global Positioning System (GPS), quantitative mapping, and GIS-based mapmaking techniques.

**DEC:**  F  
**SBC:**  SBS  
**3 credits**

**GSS 309: GIS and Cartography**
Cartography is the knowledge associated with the art, science, and technology of maps. Digital computer cartography still follows the same fundamental principles and still requires a broad understanding of graphicacy as a language (as well as numeracy and literacy). This course will provide an introduction to cartographic principles, concepts, software and hardware necessary to produce good maps, especially in the context (and limitations) of geographic information systems (GIS).

**Prerequisite:** SBC 113 or GSS 105  
**3 credits**

**GSS 313: GIS Design and Application I**
Provides the basic concepts underlying modern geographic information science and technology. Emphasis is placed on the principles of GIS for characterizing environmental systems and computer-based techniques for processing and analyzing spatial data. The course is three credit hours of lecture. This lecture course must be taken in the same semester as the associated laboratory, GSS 314.

**Prerequisite:** MAT 125 or MAT 131  
**SBC:**  TECH  
**3 credits**

**GSS 314: GIS Laboratory**
Practice using the GIS techniques and tools learned in the lecture (GSS 313), work on exercises, and process and analyze the spatial data for the course project. This laboratory course must be taken in the same semester as GSS 313.

**Corequisite:** GSS 313  
**1 credit**

**GSS 323: GIS Database and Design**
Concepts of geodatabase design and management in geographic information systems (GIS), SQL statements, geographic data types and functions, data entry, techniques of geographic information structure applications. This is a Windows based computer class with the majority of students work involving GIS computer software.

**Prerequisite:** GSS 313  
**3 credits**

**GSS 325: GIS Design & Applications II**
The course builds upon the topics covered in GIS Design and Application I. It emphasizes the applications of GIS in solving real-world problems. Students are expected to gain an understanding of GIS theory, methodology and most importantly application. Students are also expected to demonstrate abilities of spatial thinking, spatial analysis, and be able to solve practical spatial problems utilizing a GIS. Because GIS is both a tool for analysis and the visual communication of these data, students will be required to develop a GIS presentation, much as would be expected in a professional setting. This independent project will constitute a substantial portion of the final grade. This is a Windows based computer class with the majority of students work involving GIS computer software.

**Prerequisite:** GSS 313 or equivalent  
**3 credits**

**GSS 326: GIS Project Management**
The course addresses issues unique to a GIS operation such as implementation issues, decision making procedures, strategies for success, legal issues, involvement of management, marking within an organization, strategic planning, and industry outlook.

**Prerequisite:** GSS 313  
**3 credits**

**GSS 350: Applied Spatial Data Analysis**
An introduction to geospatial statistical analysis that aims to provide students with the background necessary to investigate geographically represented data. The specific focus is on spatial data analysis, such as the analysis of autocorrelation, principles of geostatistics and analysis methods that are relevant in the fields of public health, environmental/earth science and social science. An important aspect of the course is to gain hands-on experience in applying these techniques with GIS and spatial analytical software, and essential methodological and practical issues that are involved in sophisticated spatial analyses.

**Prerequisite:** AMS 102 or equivalent and GSS 313  
**SBC:**  STEM+  
**3 credits**

**GSS 355: Remote Sensing GIS Data**
Provides a basic overview of the technology by which aircraft and satellite images of the Earth are produced as well as hands on experience manipulating and interpreting. Students gain practical experience in environmental analysis using satellite imagery and commonly used sensors and analytical methods for the Earth sciences.

**Prerequisite:** GSS 105 or MAR 104 or GEO 102  
**SBC:**  STEM+  
**3 credits**

**GSS 475: Undergraduate Teaching Practicum**
Work with a faculty member as assistant in a regularly scheduled course. The student must attend all classes and carry out all assignments; in addition the student will be assigned a specific role to assist in teaching the course. The student will meet with the instructor on a regular basis to discuss intellectual and pedagogical matters relating to the course.

**Prerequisites:** Permission of instructor and undergraduate director  
**SBC:**  STEM+  
**3 credits, S/U grading**

**GSS 487: Geospatial Science Research**
Qualified advanced undergraduates may carry out individual research projects under the direct supervision of a faculty member. Repeatable to a maximum of 3 credits.

**Prerequisite:** Permission of instructor  
**0-3 credits, S/U grading**

**GSS 488: Geospatial Science Internship**
The GSS Internship is designed to provide students experience in the real workplace. Interns are expected to function as a GIS/Remote Sensing professional and work within the existing host facility structure or on a free standing project. Interns will complete assigned tasks by hosting facility such as GIS data entry, data retrieval, remote sensing analysis, GPS field work, documentation, or general GIS facility duties. These activities will be monitored by both a representative of the host facility and the instructor. May be repeated to a limit of 12 credits.

**Prerequisites:** GSS 313 and GSS 325, or instructor consent  
**SBC:**  STEM+  
**0-12 credits, S/U grading**