

EARTH & ENVIRONMENTAL STUDIES (EAES)

EAES 100 - Principles of Geography

3 Credits

The course studies the major elements of the natural environment and their interrelation. The principles and processes essential to the understanding of the natural environmental system and their significance are stressed. The elements studied include: atmosphere, weather and climate, continents, landforms, river systems, ocean currents and tides, soils, vegetation, animal and marine life. Previous course EUGS 100 effective through Spring 2012. 3 hours lecture.

EAES 101 - Planet Earth

4 Credits

An introduction to the physical characteristics of planet earth. The focus is on processes and interactions of the four components of the earth system: atmosphere, hydrosphere, lithosphere and biosphere. An understanding of the human impact on earth systems is also developed and maintained in perspective. Satellite information, aerial photography, maps, charts and other Geographic Information Systems technologies are used to study planet earth in this course. Meets Gen Ed - Natural Science Laboratory. Previous course GEOS 107 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 102 - Principles of Geology

3 Credits

Geologic materials and processes. Origin and development of the earth throughout geologic time. Evolution of life as interpreted through the study of fossils. Previous course GEOS 108 effective through Spring 2012. 3 hours lecture.

EAES 103 - Earth in Space and Time

3 Credits

The earth, its interactions with the sun, moon and planets; its origin; its major ecologic features and the geologic events of its past, present, and possible future. Previous course GEOS 109 effective through Spring 2012. 3 hours lecture.

EAES 104 - Natural Disasters

3 Credits

The study of natural disasters such as volcanic activity, earthquakes and hurricanes: the causes, effects and means of predicting, preventing and minimizing the effects of disasters will be discussed. The relationships between man and his sometimes hostile habitat will be included. Meets Gen Ed - Interdisciplinary Studies. Previous course GEOS 110 effective through Spring 2012. 3 hours lecture.

EAES 105 - Physical Geology

4 Credits

Materials of the earth; landforms and structures; the processes and agents responsible for their formation and modification. Modern tectonic concepts. Topographic and geologic maps. Required field trips. Not open to students who have had Principles of Geology. Meets Gen Ed - Natural Science Laboratory. Previous course GEOS 112 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 106 - The National Parks and their Geology

3 Credits

The National Parks and Monuments as regions of relatively undisturbed natural history. The minerals, fossils and rock formations which occur as well as the story of their formation. Specific parks and monuments will be studied in detail. Previous course GEOS 119 effective through Spring 2012. 3 hours lecture.

EAES 107 - Earth and the Environment

4 Credits

The study of the natural processes of the earth and the effects of human activities on the environment. Earth materials, processes and systems, and the engineering properties of natural materials will be discussed, as well as pollution of soil, water and air. Meets Gen Ed - Natural Science Laboratory. Previous course GEOS 125 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 109 - Freshman Seminar in Geoscience and Geography

1 Credit

This course introduces entering freshmen or transfer students to the University, the departments of the College of Science and Mathematics, the culture of higher education, and the field of geoscience and geography. Students learn about campus resources and activities, majors/careers in geoscience and geography, and techniques that foster the development of good study skills and academic success. Open to all MSU students. Previous course ENVR 199 effective through Spring 2012. 1 hour seminar.

EAES 120 - The Study of Gems

3 Credits

Mineralogy of gem materials through lectures, demonstrations and laboratory experience. Sources of gem materials; the cutting and polishing of gem materials. Not for major credit. 2 hours lecture, 2 hours lab.

EAES 140 - Dinosaurs, Their Life and Times

3 Credits

The origin, evolution, paleoecology and extinction of the dinosaurs as reflected in the history of the Mesozoic era. Previous course GEOS 135 effective through Spring 2012. 3 hours lecture.

EAES 150 - General Oceanography

3 Credits

A general study of the oceans and methods of modern oceanography including the physical, chemical, geological, and biological aspects of the oceans and their interrelationships. This course is designed for non-science majors. Meets Gen Ed - Interdisciplinary Studies. Previous course GEOS 162 effective through Spring 2012. 3 hours lecture.

EAES 160 - The Human Environment

3 Credits

An interdisciplinary course which explains the human impact, as social groups and individuals, on the natural environment. It explores the relationships and interconnectedness between natural processes and social, economic, cultural, technological, and political culture. Critical environmental issues are discussed. Meets Gen Ed - Social Science Perspectives. Previous course ENVR 109 effective through Spring 2012. 3 hours lecture.

EAES 161 - Human Geography

3 Credits

Human Geography presents the interaction of culture and environment. Variations in environment and culture result in great differences how culture is imprinted upon the environment. The role of politics, language, religion, economics, urban systems, and technology reveal the relative intensity with which culture roots in nature. Emphasis is upon culture as a force that shapes the human use of the earth. Previous course EUGS 101 effective through Spring 2012. 3 hours lecture.

EAES 170 - World Geography

3 Credits

World geography aims to present essential facts and concepts about the natural and human environment of major regions and countries. The course presents a picture of regions as developed through the interactions of natural, cultural, economic and political forces. Geopolitical, social and economic relationships between and among countries are studied. Meets Gen Ed - Social Science Perspectives. Previous course EUGS 102 effective through Spring 2012. 3 hours lecture.

- EAES 200 - Geomorphology** **3 Credits**
Prerequisite(s): EAES 100, EAES 101, EAES 105 or EAES 107. Major controls of climate and the landforms of North America are analyzed in order to gain an understanding of how the continent compares and is related to the rest of the world. The basis and distinct characteristics of the subdivisions of North America are examined in order to bring out contrasts and unique features within the continent. Previous course GEOS 254 effective through Spring 2012. 3 hours lecture.
- EAES 201 - Understanding Weather and Climate** **4 Credits**
Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Presents a basic understanding of the dynamic atmosphere and explores the impacts that weather and climate have on humans and the biosphere. Basic physical laws of energy and motion are employed to explain temperature, precipitation, atmospheric circulation, storms, and how climates vary regionally. Connections are made toward management of weather hazards, air pollution, impacts on agriculture and economy, and environmental and social implications of climate change. Lectures are supplemented by current events discussions and hands-on exercises in lab sections. Previous course GEOS 257 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 202 - Introduction to Sustainability Science** **3 Credits**
Prerequisite(s): EAES 160 and EAES 101. Introduction to sustainability science and the challenges confronting society's transition to global sustainability; an investigation into the systems and processes basic to sustainability science; and the relationship of sustainability science to business, public policy, and the sciences. Previous course ENVR 233 effective through Spring 2012. Meets the University Writing Requirement for majors in Sustainability Science. 3 hours lecture.
- EAES 204 - Geology Field Trip** **1 Credit**
Prerequisite(s): EAES 100, EAES 101, EAES 105, EAES 107 or departmental approval. A five-day to one-week trip through areas of geologic significance. A geoscience major is expected to participate in at least two of the trips. Field trip report and collection required. Expenses shared by the participants. Previous course GEOS 484 effective through Spring 2012.
- EAES 210 - Introduction to GIS and Remote Sensing** **3 Credits**
Prerequisite(s): CSIT 111, EAES 100, EAES 101, EAES 105, EAES 107, EAES 160, EAES 161 or EAES 170. Introduces the basic principles of Geographic Information Systems (GIS) and remote sensing. Focus on digital cartographic science, graphic design, spatial data and image portrayal and inquiry, map overlays, and applications. Previous course EUGS 270 effective through Spring 2012. 2 hours lecture, 2 hours lab.
- EAES 211 - Aerial Photograph Interpretation** **3 Credits**
Prerequisite(s): EAES 100, EAES 101, EAES 105, EAES 107, EAES 160, EAES 161 or EAES 170. Principles of photogrammetry and the use of aerial photographs as a significant research method to recognize and evaluate earth environments and resources. Previous course GEOS 251 effective through Spring 2012. 2 hours lecture, 2 hours lab.
- EAES 212 - Map Reading and Cartography** **4 Credits**
Prerequisite(s): EAES 100, EAES 101, EAES 105, EAES 107, EAES 160, EAES 161 or EAES 170. This course is designed to acquaint students with the characteristics of map computation, design and construction. Historical development of mapping and map reading will be important areas of emphasis. Remote sensing, computer mapping will provide up-to-date procedures. Each student will work toward a map suitable for commercial publication. Previous course GEOS 250 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 220 - Mineralogy** **4 Credits**
Prerequisite(s): EAES 101, EAES 105 or EAES 107; and CHEM 120 may be taken as a prerequisite or corequisite. Crystallography, internal structure, origin, occurrence, and properties of minerals, laboratory study of common minerals. Required field trips. Previous course GEOS 443 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 230 - Hydrology** **3 Credits**
Prerequisite(s): EAES 100, EAES 101, EAES 105 or EAES 107. Water, its availability, distribution and usefulness. Hydrologic cycle examined in detail. Interaction with man and his usage. Applications to models and systematic processes. Previous courses ENVR 252 and GEOS 252 effective through Spring 2012. 3 hours lecture.
- EAES 240 - Historical Geology** **4 Credits**
Prerequisite(s): EAES 101, EAES 105, EAES 107 or EAES 250. Geological history of the earth; the evolution of North America in terms of the changing geography, climate, and plant and animal life as interpreted from the rock and fossil record. Required field trips. Previous course GEOS 114 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 250 - Introduction to Marine Sciences** **4 Credits**
Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as a prerequisite or corequisite. A general study of the marine sciences, including origin and evolution of the oceans, physical and chemical properties of seawater, marine life, oceanic circulation, atmospheric-ocean exchange and other processes that take place in the oceans. This course also deals with marine resources and human interaction with the marine environment. Field trips required. May be taught off-campus at the NJ Marine Sciences Consortium in the summer. Meets Gen Ed - Natural Science Laboratory. Cross listed with Earth and Environmental Studies, PHMS 250. Previous course PHMS 210 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 260 - Energy, Environment and Society** **3 Credits**
Prerequisite(s): WRIT 105 or HONP 100; and MATH 106 or MATH 109; and EAES 101 or EAES 105 or BIOL 100 or CHEM 100. An introductory survey of present-day energy sources, the impact of their extraction and utilization on Earth's environment, and future options to meet the energy needs of society. Topics include basic principles of energy, carbon cycle, greenhouse effect, origin and production of fossil fuels, hydraulic fracturing ("fracking"), consequences of fossil fuel combustion, nuclear energy, renewable energy sources, energy efficiency, and conservation. Also considered are the impacts of the energy economy on international relations and the uneven distribution of the benefits and negative consequences of resource utilization. Meets Gen Ed - Interdisciplinary Studies. Previous course EAES 162 effective through Spring 2015. 3 hours lecture.
- EAES 261 - Conservation of Natural Resources** **3 Credits**
Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. The emphasis of this course is on the imbalance of world population growth and distribution in comparison with the availability of natural resources. 3 hours lecture.
- EAES 262 - Our Finite Earth: Population and Resources** **3 Credits**
Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Implications of the population explosion and the rising rate of resource consumption. Focuses on the alternative ways various societies can achieve equilibrium between population and economic development within the framework of limited world resources. Previous course EUGS 203 effective through Spring 2012. 3 hours lecture.

EAES 263 - Noise Pollution: Contemporary Problems and Issues 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Noise, noise pollution, the psycho-physical effects of noise, noise control, and hearing conservation is studied. Previous course GEOS 205 effective through Spring 2012. 3 hours lecture.

EAES 264 - The Geography of Life and Death 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Study of medical geography of diseases of man and their relationship to physical setting. Factors such as climate, soils, water nutrition and sanitation in relation to diseases will be analyzed world-wide. Human diseases also examined; national, regional, and local geographic conditions. Previous course EUGS 222 effective through Spring 2012. 3 hours lecture.

EAES 270 - Geography of North America 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Provides an understanding of the development of cultural, physical and economic landscape of the United States and Canada. Emphasizes elements of rapid change: urbanization, industrial growth, transportation, trade patterns, distribution of population and modern agriculture. Previous course EUGS 202 effective through Spring 2012. 3 hours lecture.

EAES 271 - Geography of East and Southeast Asia 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Regional analysis of East Asia (China and Japan) and Southeast Asia (Indonesia): (1) physical environments; (2) human landscape and their cultural heritages; (3) contemporary issues including economic development, political configurations, and environmental problems. Previous course EUGS 207 effective through Spring 2012. 3 hours lecture.

EAES 272 - Land and Life in Latin America 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. "Land and Life in Latin America" is a regional survey course that explores and explains the physical-human interface and the constantly changing environmental societal needs. The course focuses on the functional processes that mold contemporary states and regional realignments. Emphasis is upon environmental conservation, demographic transitions, the role of culture and politics to foster a viable ecumene. Meets World Cultures Requirement. Previous course EUGS 208 effective through Spring 2012. 3 hours lecture.

EAES 273 - New Jersey Environment: Problems and Issues 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Designed to focus attention on the physical characteristics of New Jersey in order to appreciate and understand the problems encountered in issues involved in management and protection of the natural environment. The significance of location, characteristics of landforms, climate weather patterns, soil and vegetation, will be examined together with the human impact on the landscape. Previous course GEOS 222 effective through Spring 2012. 3 hours lecture.

EAES 280 - Principles of Land Use 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Geographical analysis of rural and urban land use patterns in the United States. Field work stresses mapping techniques and socio-economic aspects of urban land use in the New York-New Jersey metropolitan area. Previous course EUGS 204 effective through Spring 2012. 3 hours lecture.

EAES 281 - Introduction to American Urban Studies 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. An interdisciplinary introduction to the development of American cities and their suburbs, with an emphasis on current patterns of urbanism and urbanization. The growth and evolution of metropolitan systems, urban-suburban ecology, and planning responses to critical metropolitan issues. Meets World Cultures Requirement. Previous course EUGS 206 effective through Spring 2012. 3 hours lecture.

EAES 282 - Urban Design and Architecture: American Cityscape 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. The evolution of American urban form and architecture from the colonial town to the contemporary metropolitan region; city plans and the emergence of professional planning; the architect and the urban environment cultural values and changing urban forms and new town design. Previous course EUGS 209 effective through Spring 2012. 3 hours lecture.

EAES 283 - Urban Geography 3 Credits

Prerequisite(s): GNED 199, WRIT 105 or HONP 100 may be taken as prerequisite or corequisite. Principles of location, interaction in the socioeconomic spheres, and the increasing importance of sustainable environmental management are dominant themes. Close attention to socio-spatial conditions, especially the housing sector, are addressed, as well as the suburbanization process and the urban sprawl challenge to a viable long-term urban system. Assignments are structured to introduce students to professional presentations, both maps and graphics, and written analysis. Meets World Cultures Requirement. Previous course EUGS 213 effective through Spring 2012. 3 hours lecture.

EAES 300 - Energy Transitions: A Global Dependence 3 Credits

Prerequisite(s): ECON 207, ECON 208, EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. This course assesses the interactions of shifting energy dependence and adaptive technologies to add energy sources to the current national energy matrices. Included in this analysis will be a discussion of the growing roster of accessible energy sources by type and environmental source and environmental limitations. History, economy, politics, and culture will be addressed to provide the social context to gauge the growing impact of energy dependence in the contemporary global system. Previous course ENVR 315 effective through Spring 2012. 3 hours lecture.

EAES 301 - Climatology 3 Credits

Prerequisite(s): EAES 201. Basic climate elements examined in terms of their influence on habitats and various aspects of human activities. The energy flux between atmosphere and biosphere affords a fundamental understanding of limitations in ecosystems development. Knowledge and climatic influences on health, clothing, human comfort, architecture, commerce and industry encourages the student to investigate new ways of living rationally within a climatic environment. Previous course GEOS 201 effective through Spring 2012. 3 hours lecture.

EAES 302 - Structural Geology 3 Credits

Prerequisite(s): EAES 200, EAES 220 or EAES 240. Recognition and interpretation of primary and tectonic rock structures laboratory work emphasizes the analysis of faults, joints, folds and foliation. Required field trips. Previous course GEOS 472 effective through Spring 2012. 2 hours lecture, 2 hours lab.

- EAES 303 - Field Geography** **3 Credits**
Prerequisite(s): EAES 200, EAES 202, EAES 210, EAES 230, EAES 281 or EAES 283. Special fee. Geographic analysis of local region. Uses of reconnaissance and survey, interviews, maps and ground and aerial photographs in information gathering. Requires individual area study. Previous course EUGS 303 effective through Spring 2012.
- EAES 310 - Geographic Information Systems (GIS)** **3 Credits**
Prerequisite(s): EAES 210. This course deals with fundamental principles and applications of GIS. Various ways in which GIS can be used in planning and management analysis and research will be discussed. Students will learn the issues which need to be considered when planning and implementing GIS. One or two widely used software packages will be employed as a tool to study GIS applications. Previous courses GEOS 470 and EUGS 470 effective through Spring 2012. 3 hours lab.
- EAES 311 - Fundamentals of Remote Sensing of Environment** **3 Credits**
Prerequisite(s): EAES 210. Systematic study of multiband spectral reconnaissance of the environment; multifrequency radar systems and their uses. Previous courses GEOS 455 and ENVR 455 effective through Spring 2012. 3 hours lecture.
- EAES 320 - Igneous Metamorphic Petrology** **4 Credits**
Prerequisite(s): EAES 220. Description, identification, classification, origin and occurrence of sedimentary, igneous and metamorphic rocks. Laboratory study of the common rocks. Required field trips. Meets the University Writing Requirement for majors in Geoscience. Previous course GEOS 444 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 321 - Economic Geology** **3 Credits**
Prerequisite(s): EAES 220. Geology and geography of non-metallic and metallic mineral resources and fuels. Problems associated with their occurrence and exploitation. Required field trips. (Not given every year.) Previous course GEOS 310 effective through Spring 2012. 3 hours lecture.
- EAES 322 - Environmental Geochemistry** **3 Credits**
Prerequisite(s): EAES 220 or CHEM 230. Chemical principles and methods applied to the study of interactions among lithosphere, hydrosphere and atmosphere. Topics such as water pollution, waste disposal and human impact on global geochemical cycles will be discussed. Laboratory will stress the measurement of chemical properties related to water and soil quality as well as computer modeling of chemical transport in porous media. Previous course GEOS 454 effective through Spring 2012. 2 hours lecture, 2 hours lab.
- EAES 330 - Fluvial Geography** **3 Credits**
Prerequisite(s): EAES 200 or EAES 230 or departmental approval. Detailed study of streams and rivers emphasizing processes causing variations of size and shape; the morphology of streams and stream channels; processes, quantitative techniques. Previous courses GEOS 352 and EUGS 352 effective through Spring 2012. 3 hours lecture.
- EAES 331 - Geohydrology** **3 Credits**
Prerequisite(s): EAES 200, EAES 230 or EAES 240. The study of ground water with particular emphasis given to its mode of migration, chemistry and relation to the geographic environment. Particular attention is given to Darcy's law, soil porosity, soil permeability and the ability to withdraw water for human consumption. Water pollutants and salt water incursions are investigated. Spatial distributions are analyzed and the processes examined. Previous course GEOS 452 and ENVR 452 effective through Spring 2012. 3 hours lecture.
- EAES 332 - Hydroclimatology** **3 Credits**
Prerequisite(s): EAES 201, EAES 230 or EAES 301. Climatology emphasizing moisture as one of the fundamental factors in climatic analysis; processes and problems of classification and variability. Examines energy and water balance. Previous course ENVR 456 effective through Spring 2012. 3 hours lecture.
- EAES 340 - Sedimentology** **4 Credits**
Prerequisite(s): EAES 200, EAES 220, EAES 230, EAES 240 and EAES 250. Geological processes and agents which form, transport, deposit, consolidate and alter sediments. Interpretation of the resultant sedimentary rocks. Laboratory work on the texture, mineralogy and mass properties of sedimentary particles. Required field trips. (Not offered every year.) Previous course GEOS 437 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 341 - Principles of Soil Science** **3 Credits**
Prerequisite(s): ANTH 270, ANTH 360, ANTH 370, BIOL 213, CHEM 230, EAES 200, EAES 220, EAES 230 or EAES 240. Origin, composition, properties and classification of soils. Additional topics include water in soils and human impact on soil resources. Laboratory covers the measurement of soil properties and principles of soil mapping and soil resource assessment. Field trips are required. Previous course GEOS 450 effective through Spring 2012. 2 hours lecture, 2 hours lab.
- EAES 342 - Invertebrate Paleobiology** **4 Credits**
Prerequisite(s): EAES 240, BIOL 213 or BIMS 220. Invertebrate fossils—their classification, morphology, evolution, stratigraphic distribution and paleoecology. Required field trips. Previous course GEOS 431 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 343 - Geoarchaeology** **3 Credits**
Prerequisite(s): ANTH 103 or GNHU 181 or EAES 100 or EAES 101 or EAES 105 or EAES 107, plus one of any of the following: EAES 200, EAES 220, EAES 240, EAES 340, EAES 341, ANTH 270, ANTH 370, GNHU 351, GNHU 361, GNHU 362, or departmental approval. This course explores the use of geological concepts and methods toward the solution of archaeological problems. Discusses earth materials and processes relevant to archaeology; evidence and timing of environmental change; human environmental impacts; field, lab, and spatial analytical techniques. Field trips expected. 2 hours lecture, 2 hours lab.
- EAES 350 - Oceanography** **3 Credits**
Prerequisite(s): EAES 240, EAES 250, PHMS 250 or departmental approval. Study of the physical and chemical properties of sea water, oceanic circulation, waves and tides, and estuarine and shoreline processes. May be taught off-campus at the NJ Marine Sciences Consortium in the summer. Cross listed with Earth and Environmental Studies, PHMS 350. Previous course GEOS 360 effective through Spring 2012. 3 hours lecture.
- EAES 360 - Contemporary Problems in Conservation of Natural Resources** **3 Credits**
Prerequisite(s): EAES 202, EAES 261, EAES 262 or departmental approval. Designed to focus attention on specific environmental problem areas or utilization of resources through assigned readings which provide background for open class discussion. Previous course GEOS 320 effective through Spring 2012. 3 hours lecture.

- EAES 361 - Environmental Policy** **3 Credits**
Prerequisite(s): EAES 202, EAES 281, EAES 283, JUST 209, LAWS 200, JURI 210, POLS 201 or departmental approval. The course studies U.S. environmental policy in air, water, land use, agriculture, energy, and waste disposal and other areas. It examines the major ideas that shape environmental policy, the institutional processes by which these ideas are turned into policy, and how these policies affect both U.S. and global environments. Issues of international environmental policy will also be discussed. Previous course ENVR 313 effective through Spring 2012. 3 hours lecture.
- EAES 362 - Environmental Gerontology** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. This course examines the social, political, economic and spatial impacts of the older adult on the environment. Topics discussed are: demographic characteristics and environmental design of senior leisure and housing environments; migration patterns; mobility, and location of older adults; and the planning, site location, design, and financing of independent and assisted adult living environments. Previous course EUGS 360 effective through Spring 2012. 3 hours lecture.
- EAES 363 - Geopolitics** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. Main theories of the field and their application to selected political entities, current problem zones and the spatial interaction of nations. Previous course EUGS 408 effective through Spring 2012. 3 hours lecture.
- EAES 370 - World Resources and Industries** **3 Credits**
Prerequisite(s): ECON 207, ECON 208, EAES 202, EAES 210, EAES 281 or EAES 283 or departmental approval. Distribution, flow and consumption of mineral resources. Political, economic and social implications of the geography of resources. Basic studies in industrial location, agricultural land use, problems of economic development and population-resource ratios. Examines world trend in production controls and market allocations. Previous course EUGS 300 effective through Spring 2012. 3 hours lecture.
- EAES 371 - Geography of Europe** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. The modern European landscape created by the activities, over many centuries, by a variety of peoples of differing cultural backgrounds, economic systems and ideologies. Previous course EUGS 304 effective through Spring 2012. 3 hours lecture.
- EAES 372 - Geography of South Asia** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. Political, cultural and economic study of India, Pakistan and Bangladesh; interrelationship between cultural and physical aspects of the regional landscape. Previous course EUGS 306 effective through Spring 2012. 3 hours lecture.
- EAES 373 - Historical Geography of the United States** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. The slow pace of settlement of the Eastern Seaboard and the development of distinctive culture hearths prior to 1800; the rapid settlement and diffusion of culture traits in the area beyond the Appalachians since 1800. Previous course EUGS 312 effective through Spring 2012. 3 hours lecture.
- EAES 374 - Latin American Environments and Economies in a Global Framework** **3 Credits**
Prerequisite(s): ECON 101 and ECON 102 and EAES 202, EAES 210, EAES 281, or EAES 283 or departmental approval. This course is structured to focus on the interactions of the physical world with economical, financial, and commercial activities in a global perspective. Environment and economics serve as thematic threads to develop dynamic models that are representative of regional—and increasingly—global linkages. Previous course EUGS 320 effective through Spring 2012. 3 hours lecture.
- EAES 375 - Culture in Transition in India: An Anthro-Geographical Approach** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. India in its geographical and socio-anthropological setting. The course focuses on the nature and processes bringing about transition in traditional values and social institutions. Previous course EUGS 330 effective through Spring 2012. 3 hours lecture.
- EAES 376 - Geography of New Jersey** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. Demographic and economic organization of the State. Spatial contrasts in population density; suburban-central city interactions; the influence of New York and Philadelphia on landscape organization. Philosophical concepts of regionalism and investigation of micro-regionalism in New Jersey. Previous course EUGS 424 effective through Spring 2012. 3 hours lecture.
- EAES 377 - Geography of Sub-Sahara Africa** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. Topical and regional study of African soils, vegetation, climate, physiography, mineral resources and other aspects of the physical environment in the light of man's habitation of the continent. Previous course EUGS 412 effective through Spring 2012. 3 hours lecture.
- EAES 378 - Geography of the Middle East** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. Topical study of area extending from Morocco to Iran: arid land agriculture, nomadism, land tenure systems, settlement patterns, problems of industrial development, and socio-economic and military implications of region's oil wealth. Includes Arab culture and Islamic influences on urban and rural landscapes. Previous course EUGS 413 effective through Spring 2012. 3 hours lecture.
- EAES 379 - Geography: The Former Soviet Union** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. Topical and regional analysis. Emphasizes demographic-ethnic composition of Soviet people, physical resource base, interregional relationships, and spatial effects of state planning programs. Previous course EUGS 419 effective through Spring 2012. 3 hours lecture.
- EAES 380 - Transportation** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281 or EAES 283 or departmental approval. Transportation is the study of spatial interaction of economic factors and societal functioning. Transportation flows are analyzed in the context of technological change, degree of accessibility, different transport cost surfaces, and transportation as it relates to land use planning. Previous course EUGS 234 effective through Spring 2012. 3 hours lecture.

- EAES 381 - Urban Field Studies** **3 Credits**
Prerequisite(s): EAES 281 or EAES 283. Off-campus study of urban conditions in New York-New Jersey metropolitan area: housing, mass transportation, social pathologies, inner city economics and the role of planning. On-campus discussion sessions alternate with field trips. Meets World Cultures Requirement. Previous course EUGS 301 effective through Spring 2012.
- EAES 382 - Geography of Manufacturing** **3 Credits**
Prerequisite(s): ECON 207, ECON 208, EAES 202, EAES 210, EAES 281 or EAES 283 or departmental approval. The world's manufacturing activities; measurement techniques; analysis of the economic, cultural and geographic bases in industrialization; plant location problems and the special situation of underdeveloped nations. Previous course EUGS 311 effective through Spring 2012. 3 hours lecture.
- EAES 383 - Location of Economic Activity** **3 Credits**
Prerequisite(s): ECON 101 and EAES 202, EAES 210, EAES 281 or EAES 283 or departmental approval. Organization of economic activity past and present refined with changes of more complex economic systems. Location factors such as physical & human resources, accessibility, routing, services, industrial sites and market advantages analyzed under varied conditions in different economic systems. Previous course EUGS 314 effective through Spring 2012. 3 hours lecture.
- EAES 384 - Managing the Urban Environment** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. An advanced interdisciplinary investigation of the modern city and its suburbs, emphasizing the impact of selected social, political and economic issues. Previous course EUGS 317 effective through Spring 2012. 3 hours lecture.
- EAES 385 - Urbanization and Environment** **3 Credits**
Prerequisite(s): EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. Examines interaction between man and the physical urban environment. Studies dynamic and physical processes as related to air, water and noise pollution, and hydrologic and geologic hazards. Previous course EUGS 331 effective through Spring 2012. 3 hours lecture.
- EAES 386 - People and Cities: Comparative Urban Studies** **3 Credits**
Prerequisite(s): ANTH 255, EAES 202, EAES 210, EAES 281, EAES 283 or departmental approval. Introduction and cross-cultural investigation of the processes of urbanism and urbanization: formation, structure and functioning of cities throughout the world. Previous course EUGS 462 effective through Spring 2012. 3 hours lecture.
- EAES 390 - Research Methods** **3 Credits**
Prerequisite(s): MATH 109 and EAES 210. The course introduces a widely used statistical package to analyze data. The application and interpretation of results of frequently used statistical techniques remains the primary focus. Survey research techniques are stressed. All the steps in the completion of a research project are emphasized. Meets the University Writing Requirement for majors in Geography. Previous course EUGS 309 effective through Spring 2012. 3 hours lecture.
- EAES 391 - Quantitative Methods in Geography and Urban Studies** **3 Credits**
Prerequisite(s): MATH 109 and EAES 210. Treatment of measurements and design in geography; definition of problems, hypotheses formulation and tests of hypotheses by alternative methods of measurement. Geographic applications of computer methods, multi-variate analysis, systems analysis, data bank maintenance and evaluation. Meets the University Writing Requirement for majors in Geography. Previous course EUGS 310 effective through Spring 2012. 3 hours lecture.
- EAES 401 - Geo-Ecology** **3 Credits**
Prerequisite(s): EAES 322, EAES 332, EAES 341, BIOL 370 or departmental approval. Spatial relations of the living environment. A systems approach to functional processes, characteristics and relationships of the ecological elements, i.e. soil, water, air, vegetation, etc. Both natural succession and human-induced changes including pollution, within the ecosystem. Previous course GEOS 404 effective through Spring 2012. 3 hours lecture.
- EAES 402 - Sustainability Science Seminar** **3 Credits**
Prerequisite(s): EAES 202, BIOL 213 and EAES 370. The course consists of a literature search and application of research tools and methodologies appropriate for completion of a project, paper, or internship in sustainability science. Previous course ENVR 465 effective through Spring 2012. 3 hours lecture.
- EAES 403 - Meteorology** **4 Credits**
Prerequisite(s): EAES 301 or departmental approval. The characteristics of the earth's atmosphere. Meteorological instruments, principles of atmospheric physics, weather patterns and measurements of changes within the atmosphere. Meets the University Writing Requirement for majors in Geoscience. Previous course GEOS 457 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 404 - Field Geology** **6 Credits**
Prerequisite(s): EAES 302, EAES 320 and EAES 441; or departmental approval. Special fee. Application of geologic principles to field mapping and interpretation in the North Central Appalachians, Rocky Mountains, and/or regional geology of another designated area. Map production and writing field reports will be emphasized. This is an intensive summer field course. Previous course GEOS 480 effective through Spring 2012. 4 hours lecture, 6 hours lab.
- EAES 410 - Advanced Topics in GIScience** **3 Credits**
Prerequisite(s): EAES 310 or EAES 311. This course will allow students with demonstrated knowledge and skills in the geographic information sciences (GIS and/or Spatial Analysis) to expand on those skills by applying them to a particular geological or geographical issue. Students will work closely with faculty to select appropriate project(s) based on the student's interest and the professor's expertise. Depending on the project's scope and scale, the course will use current software such as ESRI's ArcGIS or ERDAS Imagine. Previous courses EUGS 475 and GEOS 475 effective through Spring 2012. 3 hours lecture.
- EAES 412 - Computer Mapping** **3 Credits**
Prerequisite(s): EAES 310. The course introduces a widely used computer mapping software to make thematic customized maps. Presentation of data in the form of a graph and a chart is also stressed. General cartographic principles are emphasized. Previous courses GEOS 405 and EUGS 405 effective through Spring 2012. 3 hours lecture.
- EAES 419 - Senior Seminar in Geographic Information Science** **3 Credits**
Prerequisite(s): EAES 310, EAES 311, EAES 410 or departmental approval. Provides students with the tools and experience to develop and complete a research or problem-solving project in geographic information science. Students will produce a senior thesis or digital presentation portfolio. Previous course EUGS 467 effective through Spring 2012. 3 hours lecture.
- EAES 425 - X-ray Microanalysis** **3 Credits**
Prerequisite(s): EAES 320 or EAES 340 or EAES 341 or EAES 343 or CHEM 311 or PHYS 350 or BIOL 360 or ANTH 370 or department permission. Students will learn the theory and practical applications of energy dispersive x-ray spectroscopy, qualitative and quantitative chemical analysis of natural and synthetic materials, and x-ray mapping techniques. 3 hours lecture.

- EAES 427 - Organic Geochemistry** **3 Credits**
Prerequisite(s): AQUA 351 or BIOL 350 or BIOL 370 or CHEM 310 or CHEM 320 or CHEM 370 or EAES 320 or EAES 322 or EAES 340 or EAES 341 or EAES 342. This is a basic course in organic geochemistry, covering the occurrence of natural and anthropogenic organic matter in sediments and sedimentary rocks, emphasizing fossil fuels and environmental contaminants. Previous course GEOS 453 effective through Spring 2012. 3 hours lecture.
- EAES 441 - Stratigraphy** **4 Credits**
Prerequisite(s): EAES 220 and EAES 302 or EAES 340. Stratigraphic principles and their application. Case studies of selected regions. Local stratigraphy interpreted through field studies. Meets the University Writing Requirement for majors in Geoscience. Previous course GEOS 434 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 443 - Geology of the Vertebrates** **4 Credits**
Prerequisite(s): EAES 342. The origin, development, biogeography, paleoecology, survival or extinction, stratigraphy, and morphology of selected fossil vertebrate groups. Bio-stratigraphic and paleogeographic significance of particular fossil vertebrate faunules. Required field trips. Previous course GEOS 435 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 451 - Coastal Marine Geology** **4 Credits**
Prerequisite(s): EAES 340, EAES 350, PHMS 350, AQUA 351, EAES 441 or departmental approval. A study of the geologic processes concerned with the supra-, inter-, and sub-tidal areas of the near shore environment. Field studies will emphasize the dynamics of erosion and deposition as well as general sedimentation associated with modification of barrier beaches and other land forms of the New Jersey shoreline. Offered at the New Jersey Marine Sciences Consortium. Cross listed with Earth and Environmental Studies, PHMS 451. Previous course PHMS 481 effective through Spring 2012. 4 hours lecture.
- EAES 452 - Dynamic Beach Processes** **2 Credits**
Prerequisite(s): EAES 340, EAES 350, PHMS 350, AQUA 351, EAES 441 or departmental approval. Study of the processes and forces involved in material transport within the beach zone. Offered at the New Jersey Marine Sciences Consortium. Cross listed with Earth and Environmental Studies, PHMS 452. Previous course PHMS 483 effective through Spring 2012. 1 hour lecture, 3 hours lab.
- EAES 453 - Tidal Marsh Sedimentations** **2 Credits**
Prerequisite(s): EAES 340, EAES 350, PHMS 350, AQUA 351, EAES 441 or departmental approval. Processes involved in sediment transport and deposition within the marsh system. Geologic history of tidal marshes. Offered at the New Jersey Marine Sciences Consortium. Cross listed with Earth and Environmental Studies, PHMS 453. Previous course PHMS 484 effective through Spring 2012. 1 hour lecture, 3 hours lab.
- EAES 454 - Human Impact on the Coastal Zone** **4 Credits**
Prerequisite(s): EAES 350, PHMS 350, AQUA 351, EAES 451, EAES 452 or departmental approval. A study of man's economic, political, legal and social impacts on the physical and biological aspects of the coastal zone, primarily a field course with supporting lectures and discussion. Previous course GEOS 403 effective through Spring 2012.
- EAES 455 - Field Methods in Oceanography** **2 Credits**
Prerequisite(s): EAES 350, PHMS 350, AQUA 351, EAES 451, EAES 452 or departmental approval. This course is intended to familiarize the student with the applications and techniques of marine samplings. The nature and role of equipment will be stressed. Field experience at the New Jersey Marine Sciences Consortium field station. Previous course GEOS 466 effective through Spring 2012.
- EAES 456 - Physical Oceanography** **4 Credits**
Prerequisite(s): EAES 350, PHMS 350, AQUA 351 or departmental approval. A survey of modern oceanography and its methods including characteristics of sea water, theories of ocean currents and, in general, applications of biological, geological, physical, meteorological and engineering sciences to the study of the oceans. Offered at the site of the New Jersey Marine Sciences Consortium. Cross listed with Earth and Environmental Studies, PHMS 456. Previous course PHMS 411 effective through Spring 2012. 3 hours lecture, 3 hours lab.
- EAES 458 - Marine Science Education** **2 Credits**
Prerequisite(s): EAES 350, PHMS 350, AQUA 351 or departmental approval. Selected field experiences and laboratory methods utilized to develop resources from the marine environment to be used in teaching the various disciplines. Offered at the site of the New Jersey Marine Sciences Consortium. Cross listed with Earth and Environmental Studies, PHMS 458. Previous course PHMS 460 effective through Spring 2012. 1 hour lecture, 1 hour lab.
- EAES 459 - Independent Study in the Marine Sciences** **1-4 Credits**
Prerequisite(s): Departmental approval. Individual research projects will be selected under the guidance of a professor associated with the consortium. Open only to those advanced undergraduate students who have indicated a potential for original thinking. Offered at the New Jersey Marine Sciences Consortium. May be repeated three times for a maximum of 10.0 credits as long as the topic is different. Cross listed with Earth and Environmental Studies, PHMS 459. Previous course PHMS 498 effective through Spring 2012.
- EAES 460 - Environmental Law** **3 Credits**
Prerequisite(s): ANTH 360, EAES 300, EAES 302, EAES 310, EAES 320, EAES 322, EAES 341, EAES 361, EAES 370, EAES 390, JUST 314, JUST 330, LAWS 302, JURI 300, POLS 365 or departmental approval. The study of the National Environmental Policy Act; the Environmental Impact Statement; the Clean Air Act; the Clean Water Act; Toxic Substances Control Act; Solid and Hazardous Waste; related environmental laws, i.e. OS&H act; and litigation are analyzed. Aspects of environmental law, within which institutions and corporations must operate, are discussed. Previous courses ENVR 410 and EUGS 410 effective through Spring 2012. 3 hours lecture.
- EAES 462 - Population Problems of the World** **3 Credits**
Prerequisite(s): EAES 363, EAES 370, EAES 380, EAES 390 or departmental approval. Identification, description and analysis of the present-day distributional patterns of the world's people; demographic trends, man-land ratios. Mobility, migration and socio-economics and geographic forces affecting world population. Techniques for measurement and analysis. Previous course EUGS 421 effective through Spring 2012. 3 hours lecture.
- EAES 463 - Culture and Resource Utilization** **3 Credits**
Prerequisite(s): EAES 300, EAES 363, EAES 370, EAES 390 or departmental approval. Evaluation and utilization of resources. Examines changes of characteristics of physical resources in relation to technological and cultural change, population increases, resource depletion and accelerated redundancy of man. Previous course EUGS 423 effective through Spring 2012. 3 hours lecture.
- EAES 470 - The Geology of New Jersey** **3 Credits**
Prerequisite(s): EAES 302, EAES 320 or EAES 441. The physical features of New Jersey and their origin, geologic history, stratigraphy, paleobiology, mineralogy, structural geology, economic geology. Required field trips. Previous course GEOS 410 effective through Spring 2012. 2 hours lecture, 2 hours lab.

EAES 471 - Urban Studies: London and the British New Towns Movement **3 Credits**

Prerequisite(s): EAES 380, EAES 385, EAES 386 or departmental approval. An "in-the-field" study of London and the new towns movement in the greater London metropolitan region. Students will meet with officials and planners in such agencies as the department at environment, new towns association, and borough government and study: planning and design of new towns and greenbelts; contrasting social, political, economic, cultural and life styles of central city London and surrounding new towns; and urban re-development in central London. Previous course EUGS 428 effective through Spring 2012. 3 hours lecture.

EAES 475 - Environmental Economics **3 Credits**

Prerequisite(s): BIOL 213 or BSLW 235 or ECON 207 or ANTH 360 or EAES 300 or EAES 363 or EAES 370 or EAES 390 or JUST 314 or SOCI 314 or JUST 330 or POLS 365 or departmental approval. This course explores the economic foundations of environmental problems such as natural resource depletion, conservation, pollution control, climate change, energy and other contemporary problems. In particular, the course develops students' understanding of why resource and environmental problems have occurred from the economic point of view and what kind of economic tools can be used for informed decision-making and tackling of environmental problems. 3 hours lecture.

EAES 476 - Seminar in International Economic Geography **3 Credits**

Prerequisite(s): ECON 101 and ECON 102 and EAES 300, EAES 363, EAES 370, EAES 390, or departmental approval. An interdisciplinary seminar focusing the techniques of economics and geography on a common theme to achieve a synergistic conclusion. Previous course EUGS 461 effective through Spring 2012. 3 hours seminar.

EAES 480 - Urbanization in World Perspective **3 Credits**

Prerequisite(s): EAES 363, EAES 380, EAES 385, EAES 386, EAES 390 or departmental approval. Analysis of characteristics and patterns of urbanism and urbanization in world perspective. Studies multi-faceted problems created by rapid urbanization. Examines role of cities in regional development and modernization of rural sector in Third World. Previous course EUGS 409 effective through Spring 2012. 3 hours lecture.

EAES 481 - Problems in Urban Geography **3 Credits**

Prerequisite(s): EAES 363, EAES 380, EAES 385, EAES 386, EAES 390 or departmental approval. Seminar on the application of geographic concepts and theories to the analysis of urban problems. Field or library research projects by students on specific urban problems. Previous course EUGS 411 effective through Spring 2012. 3 hours lecture.

EAES 482 - Real Estate Principles **3 Credits**

Prerequisite(s): EAES 363, EAES 373, EAES 380, EAES 385, EAES 386, EAES 390 or departmental approval. In this course the student is introduced to the principles of real estate from a historical, social, economic, legal, and spatial perspective. The topics explored are: urban-suburban development and the real estate product; the changing nature of real estate through planning, zoning, environmental and social considerations; real estate economics and demographics from a national, local and individual parcel level; and a detailed study of the legal instruments and concepts involved in residential, commercial and industrial real estate transactions. Previous course EUGS 417 effective through Spring 2012. 3 hours lecture.

EAES 483 - Advanced Real Estate **3 Credits**

Prerequisite(s): EAES 482. This course builds on the fundamental principles introduced in EAES 482 and explores the following new topics: mortgage finance; market demand analysis for residential, retail commercial, office and industrial land use; location and site planning theory and analysis; real estate investment analysis and appraisal techniques; real estate research sources and methods; and public policy impacts on real estate. Previous course EUGS 418 effective through Spring 2012. 3 hours lecture.

EAES 484 - Urban Planning **3 Credits**

Prerequisite(s): EAES 373, EAES 380, EAES 385, EAES 386 or departmental approval. The course focuses on the principles, processes, and practices of urban planning. The formulation of policies and the management roles of the planning agencies are emphasized. Previous course EUGS 460 effective through Spring 2012. 3 hours lecture.

EAES 486 - Village to Metropolis: Urbanization in Latin America **3 Credits**

Prerequisite(s): EAES 363, EAES 380, EAES 385, EAES 386 or departmental approval. Examines urbanization in Latin America from Columbian times to the present. Portuguese and Spanish town planning practices and their evolution into modern times, including their impacts upon evolving urban morphology and subsequent metropolitanization. Previous course EUGS 444 effective through Spring 2012. 3 hours lecture.

EAES 487 - Senior Seminar in Urban Study (Urban Studies Internship) **3 Credits**

Prerequisite(s): EAES 390 or departmental approval. A seminar to be taken in conjunction with the urban studies semester internship, and designed as a synthesis of the various approaches in urban studies which the student has acquired in previous urban-related courses. Each semester the seminar focuses upon a specific in-the-field research project, and an analysis and evaluation of the student's internship experience. Previous course EUGS 464 effective through Spring 2012. 3 hours semester.

EAES 490 - Independent Study in Geography **1-4 Credits**

Prerequisite(s): Departmental approval. Preparation of a research paper or project to be presented to members of the staff. May be repeated three times for a maximum of 10.0 credits as long as the topic is different. Previous course EUGS 490 effective through Spring 2012. Independent Study.

EAES 491 - Internship **3-12 Credits**

Prerequisite(s): EAES 390 or departmental approval. A full semester internship in an urban or environmental agency. Students will be expected to carry out agency assignments, observe and participate in decision making processes and engage in middle management activities. Previous course EUGS 463 effective through Spring 2012.

EAES 492 - Honors Research **3 Credits**

Prerequisite(s): EAES 390 or departmental approval. Provides original research experience to superior undergraduates.

EAES 494 - Independent Study in Geoscience **1-4 Credits**

Prerequisite(s): Departmental approval. An opportunity for the qualified student to do library and/or laboratory investigation in a field of science of his/her choice under the guidance of a faculty member. The course is conducted exclusively by scheduled individual conferences and reports. (Offered on demand.) May be repeated three times for a maximum of 10.0 credits. Previous course GEOS 495 effective through Spring 2012.

- EAES 495 - Readings in Earth Environmental Studies** 3 Credits
Prerequisite(s): Departmental approval. Open only to Geography honor students. Students will be expected to read a number of the more definitive works in modern geography. Examination will be both oral and written. Previous course EUGS 425 effective through Spring 2012. 3 hours lecture.
- EAES 496 - Pro-Seminar in Earth and Environmental Studies** 3 Credits
Prerequisite(s): Departmental approval. Problem-oriented seminar. Specific topics in urban, environmental studies or geography. Content changes according to the needs of the instructor. May be taken three times for a total of nine credits. Previous course EUGS 427 effective through Spring 2012. Independent Study.
- EAES 497 - Senior Seminar Geography** 3 Credits
Prerequisite(s): EAES 390 or departmental approval. The course provides students with the tools and experience to develop and complete a geographic research project from start to finish. Students will be introduced to issues associated with becoming a professional geographer. Students will produce a senior thesis. Previous course EUGS 466 effective through Spring 2012. 3 hours seminar.
- EAES 498 - Seminar in Geoscience** 2 Credits
Prerequisite(s): Departmental approval. Student field, laboratory and library investigation of a problem in the area of his/her interest in geoscience; results presented in oral and written form. Class discussion of the individual papers and of other pertinent topics of current interest in geoscience. (Not offered every year.) Previous course GEOS 490 effective through Spring 2012. 2 hours seminar.
- EAES 499 - Sel Topics in Earth Environmental Studies: Glacial Deposits, Climate Archive Resource Potential** 1-4 Credits
Prerequisite(s): Departmental approval. An in-depth study of a particular topic in geoscience, the specific subject matter of which is not offered regularly in an existing course. May be repeated three times for a maximum of 10.0 credits as long as the topic is different. Previous course GEOS 494 effective through Spring 2012.
- EAES 500 - Energy Transitions: A Global Dependence** 3 Credits
Prerequisite(s): Matriculation in a graduate program or departmental approval. Not open to students who have taken EAES300. This course assesses the interactions of shifting energy dependence and adaptive technologies to add energy sources to the current national energy matrices. Included in this analysis will be a discussion of the growing roster of accessible energy sources by type and environmental source and environmental limitations. History, economy, politics, and culture will be addressed to provide the social context to gauge the growing impact of energy dependence in the contemporary global system. Previous course ENVR 515 effective through Spring 2012. 3 hours lecture.
- EAES 501 - Environmental Studies Physical** 3 Credits
A systems concept utilizing physical science. Provides some understanding of the abiotic environment to life. The atmosphere, hydrosphere, and lithosphere are examined as natural, man-modified, and human environments. Previous course ENVR 501 effective through Spring 2012. 3 hours lecture.
- EAES 502 - The Dynamic Earth** 4 Credits
Origin, evolution and history of the earth. Internal and external processes by which minerals and rocks form and are modified. Interpretation of rock features and structures and significance of the fossil record. Plate tectonics, geomorphology, oceanography, and meteorology. The course is conducted at a more rigorous level than introductory, undergraduate courses. Research project and field trips are required. Previous course GEOS 502 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 503 - Advanced Physical Geology** 4 Credits
In-depth study of the major problems of physical geology processes of erosion, rock formation, continent and ocean-basin origin and relationships, earthquakes, interior of the earth, volcanism, island arcs, mountain building, paleomagnetism, continental drift, and sea-floor spreading. Field trips. Previous course GEOS 503 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 504 - Landscapes in Transition** 3 Credits
The field in historical perspective, with emphasis upon contemporary trends; philosophical roots and quest for theory. Analyzes theory and methods of application and their relationships in order to understand the role of applied in contrast to theoretical geography. Previous course GEOS 520 effective through Spring 2012. 3 hours lecture.
- EAES 505 - Environmental Geoscience** 3 Credits
Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program or departmental approval. In-depth study of the relationships between man and the physical environment of atmosphere, hydrosphere and lithosphere. Particular attention to problems of mineral resource and fossil-fuel depletion; pollution of air, water and soils and waste disposal and recycling, simple computer modeling of environmental situations. Previous course GEOS 525 effective through Spring 2012. 3 hours lecture.
- EAES 506 - Introduction to Geographic Information Science and Remote Sensing** 3 Credits
Prerequisite(s): Departmental approval required. Introduction to GIS and Remote Sensing. Introduces the basic principles of Geographic Information Systems (GIS) and remote sensing. Focus on digital cartographic science, graphic design, spatial data and image portrayal and inquiry, map overlays, and applications. 2 hours lecture, 2 hours lab.
- EAES 507 - Tectonics** 3 Credits
Prerequisite(s): Matriculation in MS Geoscience program or departmental approval. The study of the major structures of the earth, the principle of isostasy, mountain-building, continental drift, sea-floor spreading, and possible causes of tectonism in the earth. Discussion will include the methods of study, results obtained, interpretation of the data, and the latest theories of tectonism. Previous course GEOS 572 effective through Spring 2012. 3 hours lecture.
- EAES 508 - Field Geology** 4 Credits
Prerequisite(s): Matriculation in MS Geoscience; and equivalent of EAES 302; and EAES 320 or EAES 441 or departmental approval. Not open to students who have taken EAES 404. Special fee. The principles and techniques of geologic field work. Independent and team mapping of local areas of geologic interest using modern field methods and instruments. Previous course GEOS 580 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 509 - Current Issues in Sustainability Science** 3 Credits
Prerequisite(s): Matriculation in a graduate program or departmental approval. Overview of current issues in sustainability science and the challenges confronting society's transition to global sustainability: sustainable use of natural resources; social learning; engaging scientists at the science-policy interface; and the application of systems science to better predict the consequences of human actions and forecast outcomes of the multiple interacting stresses on the life support systems around us. Previous course ENVR 533 effective through Spring 2012. 3 hours lecture.

EAES 510 - Geographic Information Systems**3 Credits**

Prerequisite(s): Matriculation in an Earth and Environmental Studies graduate program and equivalent of EAES 210 or departmental approval. Not open to students who have taken EAES 310. Provides graduate students who have finished any introductory GIS courses or equivalents an opportunity to advance both the practical skills and theoretical understanding of GIS. The course will focus on application of GIS to urban planning, locational analysis, public health, crime analysis, resource and land use management, transportation planning, environmental management etc. In the meantime, specific topics such as geovisualization, geographic database design, GIS modeling and management will be treated as an integrated part during the applications. Previous course EUGS 570 effective through Spring 2012. 3 hours lecture.

EAES 511 - Fundamentals of Remote Sensing of the Environment**3 Credits**

Prerequisite(s): Matriculation in an Earth and Environmental Studies graduate program and equivalent of EAES 210 or departmental approval. Not open to students who have taken EAES 311. This course affords graduate students who have completed introductory courses or equivalents the opportunity to advance both practical skills in and theoretical understanding of remote sensing. The course covers a wide range of applications and promotes facility in image processing and visualization, integration with Geographic Information Systems, and spatial modeling techniques. Industry-standard software is used for demonstration and laboratory exercises. A semester project must be completed that demonstrates an application of remote sensing to a real-world environmental problem. Students are required to submit a term paper, an oral presentation, and a poster related to this project. Previous courses ENVR 555 and GEOS 555 effective through Spring 2012. 3 hours lecture.

EAES 520 - Advanced Mineralogy**3 Credits**

Prerequisite(s): Matriculation in MS Geoscience and equivalent of EAES 220 Mineralogy. Chemical and physical principles as applied to minerals. Detailed study of representative minerals from the various families. Advanced techniques will be performed by the student. Field trips. Previous course GEOS 543 effective through Spring 2012. 2 hours lecture, 2 hours lab.

EAES 521 - Optical Mineralogy**4 Credits**

Prerequisite(s): Matriculation in MS Geoscience and equivalent of EAES 220 Mineralogy. Theory and practice of using the polarizing microscope to study and identify minerals; theory of light transmission in minerals; the practical effect. Required field trips. Previous course GEOS 545 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 522 - Igneous Metamorphic Petrology**4 Credits**

Prerequisite(s): Matriculation in MS Earth and Environmental Science and equivalent of EAES 220 Mineralogy. Not open to students who have taken EAES 320 or equivalent. Description, identification, classification, origin and occurrence of igneous and metamorphic rocks in order to interpret the geochemical and tectonic processes that form them. Laboratory study includes hand sample and thin-section analysis using the petrographic microscope as well as geochemical analysis using ICP-OES, ICP-MS, SEM-EDS, and/or XRD instrumentation. Required field trips. Previous course GEOS 546 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 523 - Sedimentary Petrography**4 Credits**

Prerequisite(s): Matriculation in MS Geoscience; and EAES 220 Mineralogy, EAES 337 Sedimentology or EAES 441 Stratigraphy or equivalent. The interpretative study of the structures, textures, composition and genesis of sedimentary rocks. Laboratory analyses of sediments and sedimentary rocks by optical, mechanical and chemical methods and the graphical representation of the resultant data. Previous course GEOS 538 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 524 - Igneous and Metamorphic Geology**4 Credits**

Prerequisite(s): Matriculation in MS Geoscience and equivalent of EAES 220 Mineralogy and EAES 320 Igneous and Metamorphic Petrology or departmental approval. The interpretive study of igneous and metamorphic rocks in detail with the aim of properly identifying and naming the rocks and interpreting their history: rock suites from classical areas. Required field trips. Previous course GEOS 578 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 525 - X-ray Microanalysis**3 Credits**

Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program and equivalent of one of the following: EAES 220, CHEM 410, PHYS 470 or BIOL 504 or departmental approval. Students will learn energy dispersive spectroscopy, qualitative and quantitative chemical analysis, and x-ray mapping. Previous course GEOS 547 effective through Spring 2012. 3 hours lecture.

EAES 526 - Geochemistry**3 Credits**

Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program or departmental approval. Chemical laws and principles applied to the earth, chemical composition of the earth, distribution and relative abundance of the elements. Radioactive materials, atmospheric precipitation of geochemicals, the geochemistry of polluted water (including solid and liquid wastes) study of meteorites. Required field trips. Previous course GEOS 575 effective through Spring 2012. 3 hours lecture.

EAES 527 - Organic Geochemistry**3 Credits**

Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program and equivalent of one of the following: CHEM 230, EAES 322, EAES 441 or departmental approval. Not open to students who have taken EAES 427. This is an introductory graduate course in organic geochemistry, covering the occurrence of natural and anthropogenic organic matter in sediments and sedimentary rocks, emphasizing fossil fuels and environmental contaminants. Previous course GEOS 576 effective through Spring 2012. 3 hours lecture.

EAES 528 - Environmental Forensics**3 Credits**

Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program and equivalent of EAES 427 or EAES 527 or departmental approval. Environmental Forensics seeks to answer the questions: "How did environmental contamination occur?" and "Who/what caused it?" It involves the use of analytical (geo)chemistry, field geology and biology, remote sensing, integrated with law and policy. This course will focus primarily on the methods and applications of chemical fingerprinting, using petroleum biomarkers, polycyclic aromatic compounds, isotopes, and heavy metals. Previous course GEOS 577 effective through Spring 2012. 3 hours lecture.

EAES 529 - Instrumental Environmental Analysis 3 Credits

Prerequisite(s): Matriculation in a CSAM graduate program and equivalent of one of the following: EAES 322, CHEM 410, EAES 526, EAES 527 or departmental approval. A survey of instrumentation and methods for quantitative environmental analysis of inorganic earth materials (e.g., waters, soils, sediments). Hands-on analytical techniques will typically include, but are not limited to, pH and conductivity measurements, ion chromatography, UV-Vis and optical ICP spectrometry, ICP mass spectrometry, and SEM-EDS depending on expertise of the instructor(s). Previous course GEOS 579 effective through Spring 2012. 3 hours lecture.

EAES 530 - Numerical Modeling of Earth Systems 3 Credits

Prerequisite(s): Departmental approval. This course is intended for students with even little or no background in numerical modeling. Students will learn how to approach and set up modeling problems in a simple programming environment such as Matlab. Some of the topics include ordinary differential equations, partial differential equations, and moving boundary problems. Additionally, this class will include a segment discussing and applying lessons from complex systems and nonlinear dynamics research to earth science modeling. 3 hours lecture.

EAES 531 - Hydroclimatology 3 Credits

Prerequisite(s): Matriculation in an Earth and Environmental Studies graduate program and equivalent of EAES 201, EAES 230, or EAES 301 or departmental approval. Not open to students who have taken EAES 332. Climatology emphasizing moisture as one of the fundamental factors in climatic analysis: processes and problems of classification and variability. Examines energy and water balance. 3 hours lecture.

EAES 532 - Applied Groundwater Modeling 4 Credits

Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program and equivalent of EAES 331; and MATH 116 or MATH 122 or departmental approval. Introduction to groundwater flow and contaminant transport modeling, using a variety of current software packages. Saturated and unsaturated media will be considered. Emphasis is on application of models to the solution of common problems encountered in hydrology industry and research. Previous course GEOS 552 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 533 - Water Resource Management 3 Credits

Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program or departmental approval. The spatial patterns of the water resource both as surface water and ground-water. Processes affecting availability and techniques of estimation are stressed. Previous course GEOS 509 effective through Spring 2012. 3 hours lecture.

EAES 535 - Geophysics 3 Credits

Prerequisite(s): Matriculation in MS Geoscience program. Theory and application of conventional geophysical methods: seismology, magnetism, electricity and gravity. Laboratory includes the collection and interpretation of geophysical data. Field trips. Previous course GEOS 571 effective through Spring 2012. 3 hours lecture.

EAES 539 - Principles of Soil Science 3 Credits

Prerequisite(s): One introductory Earth Science course; May not be taken if student has already completed EAES 341; Departmental approval. Origin, composition, properties and classification of soils. Additional topics include water in soils, soil ecology, human impact on soils, soil resource management. Laboratory covers the measurement of soil properties and principles of soil mapping and soil resource assessment. Field trips are required. 2 hours lecture, 2 hours lab.

EAES 540 - Advanced Historical Geology 3 Credits

In-depth analysis of major problems in geologic history, stratigraphy and paleoenvironments as interpreted through lithologic and paleontologic evidence. Required field trips. Previous course GEOS 504 effective through Spring 2012. 2 hours lecture, 2 hours lab. 3 hours lecture.

EAES 541 - Stratigraphy 4 Credits

Prerequisite(s): Matriculation in MS Geoscience program or departmental approval. Stratigraphic principles and their application. Case studies of selected regions. Local stratigraphy interpreted through field studies. Previous course GEOS 534 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 542 - Advanced Invertebrate Paleobiology 4 Credits

Prerequisite(s): Matriculation in MS Geoscience or MS Biology programs. Fossil invertebrates with emphasis on their evolutionary, paleoecologic and stratigraphic significance. Laboratory and field work stress collecting, preparation, identification, curatorial and faunal analysis techniques. Required field trips. Previous course GEOS 533 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 543 - Vertebrate Paleobiology 3 Credits

Prerequisite(s): Matriculation in MS Geoscience or MS Biology programs. The geologic history, morphology, taxonomy, paleogeography and evolution of fossil vertebrates. Required field trips. Previous course GEOS 535 effective through Spring 2012. 2 hours lecture, 2 hours lab.

EAES 544 - Sedimentology 4 Credits

Prerequisite(s): Introductory Earth Science course. Geological processes and agents which form, transport, deposit, consolidate and alter sediments. Interpretation of the resultant sedimentary rocks. Laboratory work on the texture, mineralogy and mass properties of sedimentary particles. Required field trips. (Not offered every year.) May not be taken after EAES 340. 3 hours lecture, 2 hours lab.

EAES 545 - Paleocology 3 Credits

Prerequisite(s): Matriculation in a CSAM graduate program or departmental approval. Distribution and association of fossils as interpreted from the evidence presented in the geologic record. Detailed paleoecological field study made of selected faunal assemblages. Previous course GEOS 530 effective through Spring 2012. 2 hours lecture, 2 hours lab.

EAES 546 - Micropaleobiology 4 Credits

Prerequisite(s): Matriculation in MS Geoscience or MS Biology programs. Taxonomic, morphologic, paleoecologic and stratigraphic consideration of microfossils with special emphasis on those from the marine environment. Previous course GEOS 532 effective through Spring 2012. 3 hours lecture, 2 hours lab.

EAES 547 - Paleobotany 3 Credits

Prerequisite(s): Matriculation in MS Geoscience or MS Biology programs. The taxonomy, morphology, evolution, paleoecology and stratigraphic significance of fossil plants. Required field trips. Previous course GEOS 536 effective through Spring 2012. 2 hours lecture, 2 hours lab.

EAES 548 - Biostratigraphy of New Jersey 3 Credits

Prerequisite(s): Matriculation in MS Geoscience or MS Biology programs. The geologic history, paleontology, stratigraphy and paleogeography of New Jersey. Required field trips. Previous course GEOS 537 effective through Spring 2012. 2 hours lecture, 2 hours lab.

- EAES 550 - Advanced Marine Geology** **3 Credits**
Prerequisite(s): Matriculation in a Earth and Environmental Science graduate program or department approval. Development and evolution of the ocean basins; marine sedimentation; shoreline development and classification; submarine topography; mineral resources of the sea. Laboratory analysis of marine sediments and fossil assemblages. Required field trips. Previous course GEOS 560 effective through Spring 2012. 3 hours lecture.
- EAES 551 - Coastal Geomorphology** **4 Credits**
Prerequisite(s): Matriculation in an Earth and Environmental Science or MS Biology graduate program and equivalent of EAES 200 or departmental approval. Coastlines and their evolution; processes and materials of the coastal zone; shore zone hydrodynamics and sedimentation: beach and barrier systems with special emphasis on the New Jersey shoreline. Offered at the site of the New Jersey Marine Sciences Consortium. Cross listed with Earth and Environmental Studies, PHMS 551. Previous course PHMS 581 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 559 - Special Problems in the Marine Sciences** **1-4 Credits**
Prerequisite(s): Departmental approval. An opportunity for the qualified graduate student to do research in a field of marine science selected under the guidance of a professor. Open only to graduate students who have indicated a potential for original thinking. Also offered at the site of the New Jersey Marine Sciences Consortium. May be repeated three times for a maximum of 10.0 credits as long as the topic is different. Cross listed with Earth and Environmental Studies, PHMS 559. Previous course PHMS 598 effective through Spring 2012. 3 hours lecture, 2 hours lab.
- EAES 560 - Environmental Law** **3 Credits**
The course focuses on The National Environmental Policy Act; The preparation of an environmental impact statement; The Clean Air Act; The Clean Water Act; The Endangered Species Act; Toxic Substance Control Act; Solid and Hazardous Waste and other Environmental laws. The role of environmental professionals in the formulation and implementation of environmental law and policy are discussed. Previous course ENVR 510 effective through Spring 2012. 3 hours lecture.
- EAES 561 - Environmental Law and Policy** **3 Credits**
The goal of this course is to provide students with the theoretical foundations and practical applications of Environmental Law. The course will utilize a model and method approach, which will present theory and procedure in a case problem context. The course will acquaint students with various traditional legal theories and compare and contrast them with law as it has evolved to meet the changes in society. Previous course ENVR 590 effective through Spring 2012. 3 hours lecture.
- EAES 562 - Waste Management** **3 Credits**
Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program or departmental approval. This course examines liquid waste management (sewage, sewerage, septic, and acid mine drainage) and solid waste management (composting, incineration, dumps, sanitary landfills, ocean dumping, and resource recovery). Management of radioactive wastes is included. Previous course GEOS 513 effective through Spring 2012. 3 hours lecture.
- EAES 563 - Natural Resource Management** **3 Credits**
Provide background in natural resource management; wildlife, fisheries, forests, water and related components. Includes field trips. Previous course ENVR 551 effective through Spring 2012. 3 hours lecture.
- EAES 564 - Environmental Education** **3 Credits**
Foundations of environmental education-historical, theoretical, and conceptual. Includes models, gaming encounters, and teaching strategies. Previous course ENVR 550 effective through Spring 2012. 3 hours lecture.
- EAES 565 - Environmental Change and Communication** **3 Credits**
Prepare students as professional environmentalists: Communication and journalism strategies, theory of persuasion, and roles as catalyst, solution giver, process helpers, and resource person. Previous course ENVR 509 effective through Spring 2012. 3 hours lecture.
- EAES 566 - Environmental Problem Solving** **3 Credits**
The purpose of this course is to train students to define environmental problems, develop their skills in solving these problems, as well as commitment to work toward their solution. Each lesson consists of student preparation of reading selected articles, classroom orientation, field trips, and the student-instructor follow-up. Field trip topics include pedestrian/vehicle conflict, school site development, plants as a city resource, urban/rural recreation, sign ordinances, transportation and similar topics. Offered as ENVR 508 through Spring 2012. To become EAES 566 effective Summer 2012. 3 hours lecture.
- EAES 567 - Human Environment** **3 Credits**
Discussion of population in relation to the physical environment; objectives and skills of numerous culture groups will be examined to clarify existing regional variations in the man-land relationship. Previous course ENVR 505 effective through Spring 2012. 3 hours lecture.
- EAES 568 - Environmental Studies-Social/Behavior** **3 Credits**
A systems concept utilizing social and behavioral sciences. Provides some understanding of the relationships of the cultural environment to life. The social and behavioral conditions upon the grouping of individuals are examined in natural and man-modified environments. Previous course ENVR 502 effective through Spring 2012. 3 hours lecture.
- EAES 569 - Air Resource Management** **3 Credits**
Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program or departmental approval. Spatial distribution of energy in the atmosphere treated in terms of natural factors and man's induced changes (atmospheric pollution). Incoming sun energy as modified by man is traced through the atmosphere, vegetation, soil and water. Previous course GEOS 501 effective through Spring 2012. 3 hours lecture.
- EAES 570 - Culture Regions** **3 Credits**
Seminar investigation of man's role in changing the face of the earth. Emphasis on spatial perception and cultural attitudes towards space as well as the diffusion process. Previous course EUGS 503 effective through Spring 2012. 3 hours lecture.
- EAES 575 - Environmental Economics** **3 Credits**
This course explores the economic foundations of environmental problems such as natural resource depletion, conservation, pollution control, climate change, energy and other contemporary problems. In particular, the course develops students' understanding of why resource and environmental problems have occurred from the economic point of view and what kind of economic tools can be used for informed decision-making and tackling environmental problems. 3 hours lecture.
- EAES 580 - Problems in Economic Geography** **3 Credits**
Research course examines spatial patterns of economic activities. Stress on current methodology and research interests. Previous course EUGS 502 effective through Spring 2012. 3 hours lecture.

- EAES 581 - Urban Systems Analysis** **3 Credits**
The complexity of the city and its modification by means of planning, the systems approach to urban study, the ecological base, different models of urban systems, the impact of technological change, the hierarchy of urban regions, planning in the existing systems, and creating new ones. Previous course EUGS 510 effective through Spring 2012. 3 hours lecture.
- EAES 582 - Urban and Regional Planning** **3 Credits**
Urban and regional planning analyzes planning goals at an integral level. Urban and regional planning are rooted in the need to anticipate social and economic change in space and how it needs to be organized to enhance the functions of the physical plant and conserve the habitat twenty and more years into the future. Data gathering and analysis, graphic presentation and model building are an integral part of the course. Previous course EUGS 511 effective through Spring 2012. 3 hours lecture.
- EAES 583 - Transportation Analysis and Planning** **3 Credits**
Transportation analysis addresses such diverse subject matter as technological change in the transportation media, transportation and energy, degree of accessibility, passenger trip generation by kind, commodity flows, transportation and spatial order, and transportation planning as part of urban and regional planning. Previous course EUGS 512 effective through Spring 2012. 3 hours lecture.
- EAES 584 - Urban Studies and Policy Analysis** **3 Credits**
Interdisciplinary study of urbanization, the processes that produce and shape urban agglomerations. From this holistic perspective the interaction of different social, cultural economic, political and planning forces examined for their impact upon the resulting system. Previous course EUGS 550 effective through Spring 2012. 3 hours lecture.
- EAES 585 - The Metropolitan Economy** **3 Credits**
The spacing, location and size of cities, the role of transportation in city rhythms and intra and inner city relationships. Urban design planning juxtaposed with multi-faceted decision making processes for an examination of their relative position in the management of urban systems. Previous course EUGS 551 effective through Spring 2012. 3 hours lecture.
- EAES 586 - Urban Contamination** **3 Credits**
This course uses examples from the published peer-reviewed literature to introduce the basic concepts of environmental contamination and the fundamental principles of environmental assessment. This is an introductory course at the graduate level and suitable for the students who are pursuing their graduate degree study and career in environmental education, science and management. The course will focus on environmental topics that are of current public concern and interest. 3 hours lecture.
- EAES 590 - Independent Study in Environmental Studies** **1-4 Credits**
Prerequisite(s): Departmental approval. Student must develop statement of goals and phasing for completion, prior to consultation with instructor. May be repeated three times for a maximum of 10.0 credits as long as the topic is different. Previous course ENVR 531 effective through Spring 2012.
- EAES 591 - Methods in Environmental Research** **3 Credits**
Formulation of the research problem, use of bibliographical sources and reference material organizing the research tests and measurements, analysis of data, and report writing. Previous course ENVR 503 effective through Spring 2012. 3 hours lecture.
- EAES 592 - Pro Seminar** **1-4 Credits**
Prerequisite(s): Departmental approval. Research on selected problems which will vary according to instructor. May be repeated once for a maximum of eight semester hours as long as the topic is different each time. Previous course EUGS 504 effective through Spring 2012. 1-4 hours seminar.
- EAES 593 - Research Seminar** **3 Credits**
Prerequisite(s): Matriculation in an Earth and Environmental Studies graduate program or departmental approval. Student field, laboratory, and library investigation of a problem in the area of his or her interest in geoscience, the results of which will be presented in oral and written form. Class discussion of the individual papers and of other pertinent topics of current interest in geoscience. Previous course GEOS 590 effective through Spring 2012. 3 hours seminar.
- EAES 594 - Research in Geoscience Literature** **1 Credit**
Prerequisite(s): Matriculation in an Earth and Environmental Studies graduate program or departmental approval. Investigation and evaluation of a topic in geoscience under the supervision of a faculty member by: (1) preparing a bibliography from standard sources, including an on-line computer search; and, (2) preparing a report written in standard professional format. Previous course GEOS 594 effective through Spring 2012 1 hour lecture.
- EAES 599 - Special Problems in Earth and Environmental Studies** **1-4 Credits**
Prerequisite(s): Matriculation in an Earth and Environmental Studies graduate program or departmental approval. Independent research project to be performed by the student under the guidance of the faculty. May be repeated three times for a maximum of 10.0 credits as long as the topic is different. Previous course GEOS 592 effective through Spring 2012.
- EAES 610 - Spatial Analysis** **3 Credits**
Prerequisite(s): Matriculation in an Earth and Environmental Studies program and equivalent of EAES 510 or departmental approval. This course will introduce students to techniques for the analysis of spatial data. The course will heavily utilize GIS and Remote Sensing data with particular attention to applications and manipulation techniques. Topics include characterizing spatial data, data sampling, visualization, data modeling, point pattern analysis, and spatial data interaction. Previous course EUGS 680 effective through Spring 2012. 3 hours lecture.
- EAES 611 - Advanced Environmental Remote Sensing and Image Processing** **3 Credits**
Prerequisite(s): Matriculation in a Earth and Environmental Studies graduate program and equivalent of EAES 311 or EAES 511 or departmental approval. This course provides a forum to explore cutting edge advances in remote sensing of the environment afforded by new satellite and aircraft based imaging platforms and to provide facility with image processing (IP) and geographic information systems (GIS) software. Topics covered include multispectral, hyperspectral and multiangular reflectance data, very high resolution panchromatic imagery, active radar and lidar systems, microwave imagery, advanced spatial and statistical raster analysis, and interfaces to GIS. Previous course ENVR 655 effective through Spring 2012. 3 hours lecture.
- EAES 612 - Seminar in Environmental Graphics** **3 Credits**
Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program. Use of geographic materials suitable for analysis, understanding and presenting aspects of the environment through seminar presentation. Previous courses GEOS 658 and ENVR 628 effective through Spring 2012. 3 hours seminar.

EAES 660 - Seminar in Environmental Management 3 Credits

This is a methods seminar focusing on the techniques of managing a project with environmental significance. Students will design and plan in detail a project to improve an existing environmental problem or to implement an economically important project that would minimize environmental problems. Previous course ENVR 610 effective through Spring 2012. 3 hours seminar.

EAES 661 - Instructional Design for Environmental Education 3 Credits

Prerequisite(s): EAES 564. This course will introduce students to the techniques for instructional design as they relate specifically to the goals, need, and objectives of environmental education. Previous course ENVR 553 effective through Spring 2012. 3 hours lecture.

EAES 662 - Energy and the Environment 3 Credits

Prerequisite(s): Enrollment in one of the following programs: MA in Environmental Studies, MS in Geoscience, MS in Sustainability Science, PSM in Sustainability Science w/concentration in Applied Sustainability Science, PhD in Environmental Management. Special fee. In-depth study of present-day energy sources, the impact of their extraction and utilization on Earth's environment, and future options. Topics include physics of energy, carbon cycle, greenhouse effect, origin and production of fossil fuels, hydraulic fracturing ("fracking"), consequences of fossil fuel combustion, nuclear energy, renewable energy sources (including biomass, waste-to-energy, solar, hydro, wind, tidal), as well as the technical and sociopolitical aspects of energy utilization, efficiency, and conservation. 3 hours lecture.

EAES 680 - Reading Seminar in Geography and Urban Studies 2 Credits

Required of all master's degree candidates concentrating in Geography and Urban Studies. This semester entails directed independent study in preparation for a 3-hour written comprehensive examination. Previous course EUGS 603 effective through Spring 2012. 2 hours seminar. 3 hours lecture.

EAES 681 - Urban Studies Seminar 3 Credits

The seminar is designed to analyze the contents and the concepts to formulate a holistic view of the city. Benchmark papers and research frontiers will be investigated. Previous course EUGS 610 effective through Spring 2012. 3 hours seminar. 3 hours lecture.

EAES 690 - Research Project in Environmental Studies 3 Credits

Prerequisite(s): Departmental approval. To complete the research proposal initiated in the research methods course. Previous course ENVR 695 effective through Spring 2012. 3 hours lecture.

EAES 696 - Applied Research or Internship Project in Sustainability Science 6 Credits

Prerequisite(s): EAES 509 and EAES 591 and departmental approval. Students develop an independent applied research project or semester internship project in consultation with a faculty supervisor and an external advisor from academic, business, government or not-for-profit organization. Sectors of concern include energy use and conservation; urban design and the ecology of cities; green infrastructure design and engineering; globalization and negative externalities; climate change mitigation and adaptation; global extinctions and biodiversity; eutrophication and nutrient flux; habitat loss, alteration and degradation; alteration of biogeochemical cycles and land use patterns; environmental and social justice, and the "north-south" divide; or an approved topic or internship experience. This project or full semester internship is aimed at providing real life experience and problem-solving analytics to address key sustainability issues. Students will prepare an extensive written report and deliver an oral presentation in a specific format provided by the Program at the end of the semester. Previous course ENVR 696 effective through Spring 2012. 6 hours lecture.

EAES 698 - Master's Thesis 6 Credits

Prerequisite(s): Departmental approval. Independent research project done under faculty advisement. Students must follow the MSU Thesis Guidelines, which may be obtained from the Graduate School. Students should take EAES 699 if they don't complete EAES 698 within the semester. Previous courses ENVR 698 and GEOS 698 effective through Spring 2012.

EAES 699 - Master's Thesis Extension 1 Credit

Prerequisite(s): EAES 698. Continuation of Master's Thesis Project. Thesis Extension will be graded as IP (in Progress) until thesis is completed, at which time a grade of Pass or Fail will be given. Previous courses ENVR 699 and GEOS 699 effective through Spring 2012.

EAES 700 - Earth Systems Science 3 Credits

Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program or departmental approval. This course investigates geosystems. In studying processes within the atmosphere, hydrosphere, biosphere, and lithosphere, the course provides a holistic understanding of earth's historical, present, and future systems. Current techniques and tools for data collection and analysis, such as field methods, GIS, Remote Sensing, are included in the course. Previous course ENVR 770 effective through Spring 2012. 3 hours lecture.

EAES 701 - Modeling in Environmental Science 3 Credits

Prerequisite(s): Matriculation in a College of Science and Mathematics graduate program or departmental approval. This course introduces fundamental concepts of interphase and intraphase transfer and transport related to our living environment. It focuses more on natural interphase transfer, including pathways and fate, and is mainly designed to understand the mechanics and processes. Previous course ENVR 775 effective through Spring 2012. 3 hours lecture.

EAES 710 - Advanced Geographic Information Systems 3 Credits

Prerequisite(s): Matriculation in an Earth and Environmental Studies graduate program and equivalent of one of the following: EAES 510, EAES 511, EAES 610 or departmental approval. This course will allow students with demonstrated knowledge and skills in the geographic information sciences (GIS and/or Spatial Analysis and/or Remote Sensing) to expand on the range of techniques at their disposal for analyzing and visualizing geographic and other spatial data sets. Students are expected to develop and effect a small but well-defined research project which will result in a paper and an oral presentation. The course will make much use of industry standard GIS and Remote Sensing software packages in data application, manipulation and visualization. The course will cover programming in 3GLs, 4GLs and macro languages for processing and analyzing extensive spatial data sets as well as the construction of customized graphical user interfaces for specific applications. Previous course EUGS 770 effective through Spring 2012. 3 hours lecture.

EAES 726 - Environmental Remediation 3 Credits

Prerequisite(s): EAES 526 or EAES 527 or EAES 792. This course presents the fundamental principles affecting the fate and transport of subsurface contaminants and the remediation of subsurface environments. This course covers regulatory aspects of contaminated sites and remedial actions; remedial action assessment; sources and characteristics of contaminants; fate and transport of contaminants in subsurface environments; traditional and innovative groundwater, soil and sediment cleanup technologies including pump and treat system, containment, soil vapor extraction, air sparging, bioremediation, phytoremediation, natural attenuation, stabilization/solidification, and in-situ reactive zones. 3 hours lecture.

EAES 760 - Organizational Environmental Management 3 Credits

Prerequisite(s): Matriculation in a graduate program or department approval. This course examines the impact of profit, non-profit and public organizations on the natural environment. It analyzes the pressure, the types, and the procedures for implementing an environmental management system (EMS); and case studies from various organizations. It also studies the internal and external strategies of organizations relative to environmental sustainability goals. Previous course ENVR 760 effective through Spring 2012. 3 hours lecture.

EAES 790 - Colloquium in Environmental Management 1 Credit

Prerequisite(s): Matriculation in a graduate program or departmental approval. Topical issues of current research in environmental management will be discussed. Presentations will be made by invited scholars, faculty, students, and research staff. For doctoral students in Environmental Management, the course may be repeated up to 10 times, but a maximum of 6 hours will be applied towards the PhD degree. Previous course ENVR 705 effective through Spring 2012. 1 hour lecture.

EAES 791 - Research Methods 3 Credits

Advanced research techniques, beginning with census reports, government surveys and reports from other agencies. Field research, both cultural and physical; mapping techniques; the design of appropriate scale and data transformation to familiarize the range of possibilities and the need for careful choice of data and maps. Computer applications in geographic problem solving. Previous course ENVR 721 effective through Spring 2012. 3 hours lecture.

EAES 792 - Special Topics 1-4 Credits

Prerequisite(s): Departmental approval. Special Topics is a detailed and literature intensive exploration of one particular focus in contemporary environmental management. The topic for the course will fall under one of several general areas. Topics will cover specific research areas in water-land systems, sustainability, vulnerability and equity, modeling analysis and visualization. This course is designed to fulfill elective requirements of the Doctoral Degree in Environmental Management. This course may be repeated for a maximum of 8.0 credits. Previous course ENVR 704 effective through Spring 2012.

EAES 895 - Research Project in Environmental Management I 3 Credits

Prerequisite(s): Matriculation in the PhD Environmental Management Program. The course is structured to provide doctoral students with the opportunity to develop or update the research skills needed to design and complete a dissertation. Students can either develop an independent topic for their research project in consultation with faculty advisors or they can choose to work on one of the University's on-going environmental studies research projects. Previous course ENVR 895 effective through Spring 2012. 3 hours lecture.

EAES 896 - Research Project in Environmental Management II 3 Credits

Prerequisite(s): EAES 895. The course is structured to provide doctoral students with the opportunity to develop or update the research skills needed to design and complete a dissertation. Students can either develop an independent topic for their research project in consultation with faculty advisors or they can choose to work on one of the University's on-going environmental studies research projects. Previous course ENVR 896 effective through Spring 2012. 3 hours lecture.

EAES 900 - Dissertation Advisement 3-12 Credits

Prerequisite(s): Matriculation in the Ph.D. Environmental Management Program; Advancement to Candidacy. This department requires 30 credits of EAES 900. While enrolled in EAES 900, students will work with their Dissertation Chair and their Dissertation Committee. Credits are reported as IP (In Progress) while the dissertation is being written. At the conclusion of the dissertation defense, a final grade of Pass or Fail will be recorded. Previous course ENVR 900 effective through Winter 2012.

EAES 901 - Dissertation Extension 1 Credit

Prerequisite(s): 30 credits of Dissertation Advisement. Once students have acquired 30 credits of EAES 900 Dissertation Advisement, they must enroll in 1 credit of EAES 901 in every semester in which they intend to work on the dissertation, up to and including the semester of the defense. Credits are reported as IP (In Progress) while the dissertation is being written. At the conclusion of the dissertation defense, a final grade of Pass or Fail will be recorded. EAES 901 may be repeated until the time limitation for completion of the doctoral program as specified in the Doctoral Policy Manual has been reached. Previous course ENVR 901 effective through Spring 2012.