

## Earth and Environment

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**John Parker**, Emeritus Professor  
**Tom Pliske**, Emeritus Lecturer  
**René Price**, Associate Professor  
**Gary Rand**, Professor  
**Jennifer Rehage**, Assistant Professor  
**James Riach**, Lecturer  
**Edward Robinson**, Research Associate  
**Mike Ross**, Associate Professor  
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**Raymond Scattone**, Lecturer  
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### **Affiliated Faculty**

**Elizabeth Anderson**, *Global Water for Sustainability*  
*(GLOWS)*  
**Maria Aysa**, *Global and Sociocultural Studies*  
**Bradley Bennett**, *Biological Sciences*  
**Jerry Brown**, *Global and Sociocultural Studies*  
**Yong Cai**, *Chemistry and Biochemistry*  
**Shlomi Dinar**, *Politics and International Relations*  
**Maureen Donnelly**, *Biological Sciences*  
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**Jim Fourqurean**, *Biological Sciences*  
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**Evelyn Gaiser**, *Biological Sciences*  
**Piero R. Gardinali**, *Chemistry and Biochemistry*  
**Jennifer Gebelein**, *Arts and Sciences Dean's Office*  
**Michael Heithaus**, *Biological Sciences*

**Gail Hollander**, *Global and Sociocultural Studies*  
**Rudolf Jaffe**, *Chemistry and Biochemistry*  
**Jeff Joens**, *Chemistry and Biochemistry*  
**B. M. Golam Kibria**, *Mathematics and Statistics*  
**Suzanne Koptur**, *Biological Sciences*  
**David Lee**, *Biological Sciences*  
**Rod Neumann**, *Politics and International Relations*  
**Steve Oberbauer**, *Biological Sciences*  
**George O'Brien**, *Education*  
**Laura Ogden**, *Global and Sociocultural Studies*  
**Kevin O'Shea**, *Chemistry and Biochemistry*  
**Stewart Reed**, *US Department of Agriculture*  
**Laurie Richardson**, *Biological Sciences*  
**Berrin Tansel**, *Civil and Environmental Engineering*  
**Joel Trexler**, *Biological Sciences*  
**Carlton Waterhouse**, *Law School*  
**Kevin Whelan**, *US Geological Survey*  
**Yan Yan Zhou**, *Mathematics and Statistics*

Knowledge of the Earth and its environments is essential for successful stewardship of our home planet. The mission of FIU Department of Earth and Environment is to be at the forefront of research and education on the dynamic interaction of Earth's systems, the environment, and related societal issues. Programs in the department address understanding and stewardship of the natural Earth. In addition, the department fosters understanding of the planet's bounty, such as water, mineral, energy and agricultural resources. A third area of emphasis is environmental problems, both natural, such as earthquakes, volcanic eruptions and floods, and human-made, such as oil spills, ecosystem degradation and soil erosion. The department offers the Master of Science Degree and Doctor of Philosophy Degree in Geosciences and the Master of Science (M.S.) in Environmental Studies.

## Master of Science and Doctor of Philosophy Degree in Geosciences

These degree programs offer opportunities for concentrated studies in structural geology/tectonics, igneous petrology/geochemistry/ economic geology, hydrogeology and environmental geology, stratigraphy/sedimentology, paleobiology, paleoecology, geophysics/paleomagnetism and atmospheric sciences/meteorology. In addition, students may select a concentration in the regional geology of Southern Florida, the Caribbean, and Latin America, including problems related to the above-mentioned fields. Overall, the graduate program emphasizes a multidisciplinary approach to solving geologic and environmental problems, and stresses the importance of field observation complemented by laboratory analysis and numerical modeling.

The department is well-equipped with advanced and basic geological instrumentation. Major on-site analytical facilities are an electron microprobe and scanning electron microscope housed in the Florida Center for Analytical Electron Microscopy (FCAEM), two thermal ionization mass spectrometers (VG-354), inductively coupled plasma emission spectro-analyzer, and a paleomagnetism laboratory with cryogenic magnetometer. In addition the department owns a complete array of instruments for field geophysics and for field hydrologic studies, and two vehicles for transportation to local field sites. The

department has facilities for micropaleontological studies, research in high pressure experimental petrology and experimental structural geology, a class 100 clean laboratory for processing isotopic samples, and a microscopy lab with heating/freezing stage for fluid inclusion studies. Excellent facilities for chemical analysis such as the stable isotope mass spectrometry lab, are available through formal connections with the Southeast Environmental Research Center.

### Application Procedures

Admission decisions to the Geosciences Program will be made by the Department's Graduate Admission Committee. To be considered for admission, applicants must submit the following documents prior to the admission deadlines.

1. FIU On-line Graduate Application Form (available at <http://gradschool.fiu.edu>).
2. Official transcripts of all college level work. When applicable, a certified English translation must accompany the original.
3. Graduate Record Examination and English proficiency (TOEFL and TSE) exam scores taken within the previous three years, sent from the Education Testing Service.
4. A resume with pertinent information regarding applicant's previous experience and achievements.
5. A statement of intent, including a brief discussion (not to exceed 2000 words) of educational goals and career projections. The applicant may also include a copy of previous written scientific work.
6. Three letters of recommendation from former professors or academic advisors.
7. Official transcripts and test scores should be sent directly to the Office of Graduate Admissions, Florida International University, P.O. Box 659004, Miami, FL 33265, with the application fee. A cover letter, photocopies of transcripts and test score reports, resume, statement of intent and letters of recommendation should be sent to the Graduate Coordinator, Department of Earth Sciences, Florida International University, Miami, FL 33199.

### Admission

To be admitted to the Graduate Programs in Geosciences, a student must meet the following minimum requirements:

1. Hold a Bachelor's or Master's degree from an accredited college or university in a relevant discipline of science, engineering or mathematics.
2. Have a grade point average (GPA) of 3.0 or higher (or equivalent) during the last two years of undergraduate program, and 3.0 or higher during the Master's degree program.
3. Have a minimum combined score on the verbal and quantitative sections of the Graduate Record Examination (GRE) of 1000 for the M.S. program or 1120 for the PhD program.
4. International graduate student applicants whose native language is not English are required to submit a score for the Test of English as a Foreign Language (TOEFL) or for the International English Language Testing System (IELTS). A total score of 80 on the iBT TOEFL, 550 on the paper-based TOEFL, 213 on the CBT TOEFL or 6.5 overall on the IELTS is required. A score of at least 50 on the Test of Spoken

English (TSE) is required in order to be eligible for a teaching assistantship.

5. Meet the University's general requirements for admission to graduate programs. All application materials should be submitted by February 15 in order to be considered for Fall term admission and by September 1 for Spring term admission.

### Financial Aid

The Earth and Environment Department offers a number of graduate teaching and research assistantships which are awarded each semester on a competitive basis. The assistantships provide a stipend and waiver of tuition, and are usually not awarded to students pursuing the Non-Thesis Track M.S. degree. Applicants interested in an assistantship should indicate this in the FIU Graduate Application form and their cover letter. Applicants seeking assistantships should contact individual faculty members in their area of research interest.

### Master of Science in Geosciences

The Master of Science degree is conferred upon successful completion of the requirements (listed below) of either the Thesis Track or Non-Thesis Track option of the degree program.

#### Thesis Track: Course Requirements: 30 credits, including:

GLY 5931/GLY 6931, Graduate Seminars	2
Courses in field of specialization	18
Electives	4
GLY 6971, Thesis	6

Courses in the field of specialization and electives are chosen by the student in close consultation with a faculty advisor. These courses are selected to fit the student's particular professional goals and to ensure sufficient depth and breadth of geological knowledge.

#### Thesis Track: Graduation Requirements

1. A minimum GPA of 3.0 in all coursework counted toward the 30 credits required for the Master's degree.
2. Satisfactory completion and defense of a thesis proposal and an original research thesis.

#### Non-Thesis Track: Course Requirements: 30 credits, including:

Courses in field of specialization	18
Electives	12

Electives may include at most 3 credits of Supervised Research (GLY 6910) leading to a research paper.

#### Non-Thesis Track: Graduation Requirements:

A minimum GPA of 3.0 in all course work counted toward the 30 credits required for the Master's degree.

### Combined BS/MS in Geosciences

The accelerated BS/MS degree program in Geosciences allows qualified students to earn both degrees in a shorter amount of time than typically required for earning degrees sequentially. The accelerated program is designed for highly qualified undergraduate students in the Earth and Environment, allowing them to complete their MS degree within approximately 2.5 years after starting their second year.

To be considered for admission to the combined bachelor's/master's degree program, students must have completed at least 75-90 credits in the bachelor's degree program at FIU and meet the admissions criteria for the graduate degree program to which they are applying. Students need only apply once to the combined degree program, but the application must be submitted to Graduate Admissions before the student starts the last 30 credits of the bachelor's degree program. A student admitted to the combined degree program will be considered to have undergraduate status until the student applies for graduation from their bachelor's degree program. Upon conferral of the bachelor's degree, the student will be granted graduate status and be eligible for graduate assistantships. Only 5000-level or higher courses, and no more than the number of credits specified by the program catalog, may be applied toward both degrees.

### Admission Requirements

- Current enrollment in the Bachelor of Science program in Geosciences at FIU.
- Completed at least 75-90 credits of coursework (including UCC and CLAS).
- Minimum GPA of 3.2.
- Minimum GRE (verbal + quantitative) score of 1000.
- Three letters of recommendation.
- Approval by the Earth and Environment Graduate Committee.

### General Requirements

- Meet the requirements of both the BS and MS degree in Geosciences.
- Overlap: Up to 3 courses (9 credits) may be used in satisfying **both** the BS and MS degree requirements, which must be at the 5000-level or higher.

## Doctor of Philosophy in Geosciences

The Doctor of Philosophy in Geosciences is conferred based on satisfactory completion of required course work, a demonstrated mastery of a broad field of knowledge, and the ability to conduct original and independent research. A minimum of 75 credit hours beyond the Bachelor's degree is required for the Ph.D. A minimum of 24 credit hours is devoted to research toward the Ph.D. Dissertation. A maximum of 36 graduate credit hours of formal lecture courses earned as part of a graduate degree from another accredited program may be transferred with the approval of the major advisor and Graduate Program Director.

### Course Requirements

GLY 5931/GLY 6931, Graduate Seminars	2
Formal graduate level courses (non-research courses chosen in consultation with the major advisor)	30
GLY 7980, Ph.D. dissertation	24

The remaining credits may be either formal graduate level courses or independent study and special projects, selected in consultation with the major advisor.

### Graduation Requirements

1. A minimum GPA of 3.0 in all course work required for the Ph.D. degree.

2. Satisfactory performance on qualifying examinations on general geologic knowledge and the field of sub-specialization.
3. Successful presentation of a research proposal and oral examination before the dissertation committee in the candidacy examination.
4. Completion and successful defense of a dissertation.

## Fields of Concentration

### Geophysics/Paleomagnetism/Remote Sensing

Geophysical investigative techniques using remote sensing, gravity, magnetism, seismic reflection and refraction, earthquake seismology, and thermal properties. Land-based geophysical studies of the Caribbean and South American seismicity and crustal structure.

### Hydrogeology/Environmental Geology

Field and modeling approaches to groundwater flow and solute fluxes in subsurface and near subsurface environments. Interaction of surface water and groundwater, solute transport, chemical and isotopic tracing techniques, watershed hydrology in south Florida, other U.S. locations, and Central America.

### Igneous Petrology/Geochemistry/Economic Geology

Research problems in petrology/geochemistry of igneous and metamorphic rocks with reference to their origin, and relationships in time and space. Origin of hydrothermal and other economic deposits. Field occurrence, geochemistry and petrogenesis of crystalline rocks, especially those of the Caribbean region and South America. Generation of associated (often, economically significant) hydrothermal deposits. Application of trace element and isotope geochemistry to the study of these petrogenetic associations.

### Paleobiology/Paleoecology

Research applied to taxonomy, phylogeny, evolutionary processes, paleoecology, taphonomy, and biostratigraphy as applied to select fossil groups. Zonal distribution, facies analysis, and paleoecology of different groups of fossils. Specialization may be in macrofossils or microfossils, applied to several aspects of the paleobiology of particular fossil groups, including biodiversity, paleoecology, response to global climatic changes, oceanographic or environmental and time relationships of selected organisms.

### Regional Geology

Multidisciplinary geologic research applied to a specific geographic area.

### Stratigraphy/Sedimentology

Sedimentary petrology, sedimentary environments, paleo-oceanography, sequence stratigraphy, cyclic stratigraphy, microfacies analysis, and basin analysis. Field and laboratory techniques applied to solution of problems in these topics, especially as applied to sedimentary rock sequences of south Florida, the Caribbean, and Meso-America. Evolution of the sedimentary basins of these regions and their relationships to global and regional tectonics.

### Structural Geology – Tectonics

Field oriented research on methods of structural analysis. Analysis of geologic deformations based upon the

principles of geometry, mechanics and utilizing research data from laboratory and field investigations of folds, fabrics, fracture, and faulting. Structural geology of the Caribbean and South America.

## Master of Science in Environmental Studies

The Department of Earth and Environment offers the Master of Science (M.S.) in Environmental Studies degree to train students for work in the areas of environmental policy, natural resource science and management, and sustainable development, with particular focus on the South Florida region, the Caribbean Basin, Asia and Latin America. An emphasis of the program is the cultural and political milieu in which environmental issues of the region are embedded. The program is interdisciplinary in nature, and students will be encouraged to take advantage of University-wide resources, programs, and courses in environmental issues, such as those in Public Administration, International Relations, Biology, Chemistry, Earth Sciences, Political Science, Economics, and Sociology/Anthropology.

The M.S. degree program offers two options: thesis track and non-thesis track. The thesis track involves rigorous, solutions-oriented scientific research into the functioning of environmental systems. This track is highly recommended for students who are coming directly from undergraduate programs and who are interested in doctoral research in the future. The non-thesis track is primarily designed for employed professionals who may want to enhance their careers and skills through additional academic training beyond their bachelor's degree and practical training through internships with agencies, corporations, non-profit organizations or academic institutions. It is not recommended for students who do not have job experience.

### Admission Requirements

To be admitted into the master's program in Environmental Studies, a student must meet the University's graduate admission requirements and:

1. Have a "B" average in upper level work, and a combined score of 1000 (quantitative and verbal) on the GRE, which every candidate must take. International graduate student applicants whose native language is not English are required to submit a score for the Test of English as a Foreign Language (TOEFL) or for the International English Language Testing System (IELTS). A total score of 80 on the iBT TOEFL or 6.5 overall on the IELTS is required.
2. Have submitted three letters of recommendation, a one page statement of research interests, and a copy of all transcripts to the Graduate Program Director on or before March 1 for the Fall admissions and October 1 for the Spring admissions.
3. Have received approval of the departmental graduate program committee.

### Degree Requirements

The Master of Science in Environmental Studies requires 36 credits, including the specific requirements (listed below) of either thesis track or non-thesis track option of the degree program. A maximum of six credits of post baccalaureate graduate course work may be transferred

from other institutions, subject to approval of the graduate committee. Particular courses will be determined by the student in consultation with the thesis advisory committee, faculty advisor, or the Graduate Program Director.

### Thesis Track: Course Requirements

EVR 5320	Environmental Resource Management	3
EVR 5355	Environmental Resource Policy	3
EVR 6950	Graduate Seminar	3
EVR 6971	Master's Thesis	6
	Research Methods or Analysis Course	3
	Electives	18
	Total Credits	36

The research methods course and electives are selected in consultation with student's thesis advisor. Elective courses are chosen in one of the two graduate concentrations (see below) and fit the student's thesis research. Additional Master's Thesis, Thesis Research, or Graduate Independent Study up to a maximum total of 3 credits may also be applied as elective credit. A maximum of six credit hours may be taken at the 4000 level, and a minimum of six credit hours of electives must be taken in Environmental Studies. Students must demonstrate a competency in Statistics (equivalent to two courses of undergraduate statistics, taken prior to the admission into the program, with a "B" or better grade in both courses, or two courses of graduate statistics with a "C" or better grade in both courses). Additional course work may be recommended by the advisory committee.

### Thesis Track: Graduation Requirements

A grade of 'B' or higher must be obtained in all core courses. A grade of 'C' or higher must be obtained in all courses, with a cumulative GPA of 3.0 or higher in the 36 credits. A thesis must be completed and successfully defended in consultation with the student's graduate thesis committee.

### Non-Thesis Track: Course Requirements

EVR 5320	Environmental Resource Management	3
EVR 5355	Environmental Resource Policy	3
EVR 5907	Research and Independent Study	3
EVR 6950	Graduate Seminar	3
	Quantitative Methods Course	3
	Electives	21
	Total Credits	36

The quantitative methods course and electives are selected in consultation with faculty advisor. Elective courses are chosen in one of the two graduate concentrations (see below), and to fit the student's particular professional interest and to ensure sufficient breadth and depth of environmental studies knowledge. Students carrying out research, internship or independent study for their non-thesis project should sign up for EVR 5907, but may not exceed six credits total. EVR 6970 and EVR 6971 will not count toward electives. A maximum of six credit hours may be taken at the 4000 level. A minimum of twelve elective credits must be taken in Environmental Studies. All courses except EVR 6950 must be taken for letter grades.

### Non-Thesis Track: Graduation Requirements

A grade of "B" or higher must be obtained in all core courses. A grade of "C" or higher must be obtained in other courses, with a cumulative GPA of 3.0 or higher in the 36 credits. A project (EVR 5907) must be completed

under faculty supervision, and the project report must be presented as a part of the Graduate Seminar class. This work may be based on a specific field research, or internship of current occupation. A project is defined as a substantial analysis and proposal for change of real-world environmental problem.

### **Combined BS/MS or BA/MS in Environmental Studies**

To be considered for admission to the combined bachelor's/master's degree program, students must have completed at least 75-90 credits in the bachelor's degree program at FIU and meet the admissions criteria for the graduate degree program to which they are applying. Students need only apply once to the combined degree program, but the application must be submitted to Graduate Admissions before the student starts the last 30 credits of the bachelor's degree program. A student admitted to the combined degree program will be considered to have undergraduate status until the student applies for graduation from their bachelor's degree program. Upon conferral of the bachelor's degree, the student will be granted graduate status and be eligible for graduate assistantships. Only 5000-level or higher courses, and no more than the number of credits specified by the program catalog, may be applied toward both degrees.

#### **Admission Requirements**

- Current enrollment in the Bachelor's Degree Program in EVR at FIU.
- Completed at least 75-90 undergraduate credit hours.
- Current GPA of 3.25 or higher.
- GRE combined score of 1000 (quantitative and verbal).

#### **General Requirements**

- Completed Bachelor's Degree in EVR at FIU.
- EVR 5320 Environmental Resource Management can substitute for EVR 4023 Biotic Resources for BS majors and be taken as an elective/area of concentration by BA majors.
- BA and BS majors can take EVR 5355 Environmental Resource Policy instead of EVR 4352 US Environmental Policy.
- Two-Three graduate electives (6-9 credits) can be counted towards areas of concentration for BA majors, or as electives or resource courses for BS majors.
- Take one section of EVR Graduate Seminar for EVR 4920 Undergraduate Senior Seminar.
- Students are expected to have 12-18 graduate course credits by the time they receive the undergraduate degree.

### **Graduate Concentrations for the Master of Science in Environmental Studies**

The Department of Environmental Studies currently offers graduate-level concentrations in two different areas. 1) environmental policy and society, and 2) environmental sciences. A list of electives for each of these

concentrations can be obtained from the Department's Office.

### **Juris Doctor/Master of Science in Environmental Studies Joint Degree Program**

The faculties of the College of Law and the College of Arts and Sciences at Florida International University offer a joint degree program culminating in both a Juris Doctor (J.D.) degree, awarded by the College of Law, and a Master of Science in Environmental Studies (MS-ES) degree, awarded by the College of Arts and Sciences. Under the joint degree program, a student can obtain both degrees in significantly less time than it would take to obtain both degrees if pursued consecutively. Essential criteria relating to the joint degree program are as follows:

1. Candidates for the program must meet the entrance requirements for and be accepted by both Colleges. Both Colleges must be informed by the student at the time of application to the second program that the student intends to pursue the joint degree.
2. The joint degree program is not open to students who have already earned one degree.
3. For law students, enrollment in the MS-ES program is required no later than the completion of 63 credit hours in the J.D. program. For MS-ES students, enrollment in the J.D. program is required no later than the completion of 24 credit hours in MS-ES program.
4. A student must satisfy the curriculum requirements for each degree before either degree is awarded. For the MS-ES degree, students must meet the requirement of the non-thesis track option. The College of Arts and Sciences will allow 6 credit hours of foundation law courses and up to 9 credit hours of upper level environmental law courses to be credited toward both the MS-ES and J.D. degrees. These law classes will count toward the non-EVR Environmental Studies elective credits allowed under the MS-ES non-thesis track program. Reciprocally, law students may receive 9 hours of credit toward the satisfaction of the J.D. degree for courses taken in the MS-ES curriculum upon completion of the MS-ES degree curriculum with a grade point average of 3.0 or higher.
5. The College of Arts and Sciences will recognize any significant, environment-related law review or research project completed with a letter grade of 'B' or better for the J.D. program toward the 3 credit hour course, EVR 5907 Research and Independent Study and the attendant 'Project' required for the MS-ES non-thesis track program. For the purpose of this program, a Project is defined as a substantial analysis and proposal for change of a real-world environmental problem, and requires preparation of a report and presentation as part of the required Environmental Studies Graduate Seminar class.
6. A student enrolled in the joint degree program may begin the student's studies in either College, but full time law students must take the first two semesters of law study consecutively and part-time law students must take the first three semesters of law study consecutively. Students admitted to one College but electing to begin study in the other College under the joint degree program may enter the second College

thereafter without once again qualifying for admission so long as they have notified the second College before the end of the first week of the first semester in the second College and are in good academic standing when studies commence in the second College.

7. A student enrolled in the joint degree program will not receive either degree until the student has satisfied all of the requirements for both degrees, or until the student has satisfied the requirements of one of the degrees as if the student had not been a joint degree candidate.
8. As non-thesis track MS-ES students, students in the joint degree program will not normally be eligible for the graduate teaching assistantships in the Environmental Studies Department.

## Course Descriptions

*Note:* Laboratories may not be taken prior to the corresponding lecture course. Laboratories must be taken concurrently where noted, but students must register for the laboratory separately.

### Definition of Prefixes

ESC-Earth Science; EVR-Environmental Studies; EVS-Environmental Science; GIS-Geography; Information Science; GLY-Geology; MET-Meteorology; OCG-Oceanography-Geological; SWS-Soil and Water Sciences F-Fall semester offering; S-Spring semester offering; SS-Summer semester offering.

**ESC 5005 Earth Science Enrichment Activities for Teachers (1-2).** Workshop presenting Earth Science enrichment activities to high school and middle school science teachers.

**ESC 5162 Workshop: Microfossil Paleoenvironments (2).** Recent foraminifera and diatoms are sampled, prepared and identified from marine to freshwater facies. Taxon distributions are used to interpret paleoenvironments. Prerequisite: Permission of the instructor.

**EVR 5005 Environmental Science and Sustainability (3).** Introductory environmental science course for graduate students in environmental studies and other disciplines. Emphasizes physical sciences and applications to environmental issues.

**EVR 5044 Advanced GIS and Environmental Data Analysis (3).** Explores project planning, geospatial database design and implementation of analytical and display methods in GIS for organizing, querying, analyzing and presenting spatial data. Prerequisites: One of the following: EVR 5050, CGN 4321, CGN 5320, INR 4931, URS 6930.

**EVR 5061 South Florida Ecology: Field Studies (3).** Introduction to ecology of South Florida. Series of field trips to unique ecosystems (Everglades, hardwood hammocks, coastal regions). No science background required. Intended for teachers. Not intended for Environmental Studies graduate students.

**EVR 5065 Ecology of Costa Rican Rainforest (3).** Intensive study of Central American tropical forest ecosystems conducted for two weeks in Costa Rica in sites ranging from lowland to high mountains. Primarily for

teachers. Prerequisites: Graduate standing or permission of the instructor. (SS)

**EVR 5066 Ecology of the Amazon Flooded Forest (3).** Study of the ecology of the flooded forest with emphasis on the relationships between plants and animals and the annual flooding cycle. The course includes a two-week field study at river camp in Peru. Prerequisites: Graduate standing or permission of the instructor. (SS)

**EVR 5069 Wetland Ecology and Management (3).** Principles of ecology and management as applied to freshwater and estuarine wetlands. Prerequisites: Undergraduate degree in science, or PCB 3043, or permission of the instructor.

**EVR 5215 Water Resources Assessment (3).** Elements of hydrological cycle, hydrological processes and water resources assessment with emphasis on surface and groundwater water quantity and quality evaluation is central to the course.

**EVR 5236 Air Pollution Dynamics (3).** A course designed to give an understanding of the fates of atmospheric pollutants. Scavenging processes in the atmosphere; radiation, residence times, chemical reactions, global transport process, point source dispersion and modeling calculations. Prerequisites: EVS 3360 or EVR 4231.

**EVR 5313 Renewable Energy Sources (3).** An analysis of renewable energy sources and energy efficiency including wind, biomass, geothermal, hydroelectric, solid waste, solar heating, solar cooling, and solar electricity. Prerequisite: Permission of the instructor.

**EVR 5315 Energy Resources and Systems Analysis (3).** Detailed analysis of energy flows in natural and manmade systems. Energy systems analysis. Energy use patterns. Conventional and alternate sources of energy.

**EVR 5320 Environmental Resource Management (3).** The scientific and philosophical basis for the management of renewable and non-renewable energy, mineral, air, water, and biotic resources. Prerequisites: Graduate standing or permission of the instructor. (F)

**EVR 5332 Integrated Solutions for Water in Environment and Development (3).** Examines the theory and practice of integrated water resources management, focusing on science, policy, and socioeconomic themes evaluated through case studies from different regions of the world. Emphasis given to environmental elements.

**EVR 5350 International Organizations & Environmental Politics (3).** The role of international organizations in environmental politics and the process of their formation and change in response to environmental problems. Prerequisites: Graduate standing or permission of the instructor.

**EVR 5353 International Energy Policy (3).** Focuses on the distribution of global energy resources and related issues. A comparison of the energy policies of various countries serves as the basis for exploring alternative energy policy approaches. Prerequisites: EVR 5355 or permission of the instructor.

**EVR 5355 Environmental Resource Policy (3).** A survey of international and national environmental policy and the legal, economic, and administrative dimensions of

international accords and selected U.S. law. Prerequisites: EVR 5320 or permission of the instructor. (S)

**EVR 5410 The Human Population and Earth's Ecosystems (3).** Explores the impact of the human population of Earth's ecosystems. Reviews current population data at global, regional, and local scales. Includes study of specific South Florida carrying capacity issues.

**EVR 5907 Research and Independent Study (VAR).** The student works with a professor on a research project. Variable credit.

**EVR 5935 Special Topics (VAR).** A graduate-level course dealing with selected environmental topics. The content will not necessarily be the same each time the course is offered.

**EVR 5936 Topics in Environmental Studies (3).** An analysis of several current environmental topics. Recommended for primary and secondary school teachers.

**EVR 6067 Tropical Forest Conservation and Utilization (3).** Distribution and classification of tropical forest ecosystems, their description and the ecological principles governing their function. Factors influencing tropical forest utilization and destruction, and strategies for sustainable use and conservation. Prerequisites: EVR 5355 or permission of the instructor.

**EVR 6268 Remote Sensing in Hydrology (3).** Sensors, platforms, satellites; image rectification, classification; data assimilation and parameterization; soil moisture, rainfall, discharge, evapotranspiration measurement, modeling and validation. Prerequisites: GLY 5754 or equivalent or permission of the instructor and EVR 5215 or EVR 4211 or equivalent or permission of the instructor.

**EVR 6300 Topics in Urban Ecology (3).** Topics include urban and suburban ecosystems emphasizing energy relations, ecological functions of urban landscapes, urban wildlife, urban forestry and ecological issues relevant to human health and well-being. Prerequisites: PCB 3043 or permission of the instructor.

**EVR 6330 Tropical Ecosystems Management (3).** Analyzes the dimensions of tropical ecosystems management. Organizational and institutional dynamics of the management of tropical forests, agriecosystems, and coastal areas are covered. Prerequisite: Permission of the instructor.

**EVR 6360 Protected Area Management (3).** Interdisciplinary examination of ecological, administrative, and socio-economic aspects of managing protected natural areas. Case studies from developed and developing nations.

**EVR 6405 International Biological Conservation Accords (3).** Survey of international biological conservation agreements. Topics include bilateral migratory wildlife agreements, the Berne Convention on Migratory Wildlife, CITES, Ramsar, the UNCED Biodiversity Treaty and the Statement of Principles on Forests. Prerequisites: EVR 5355 or permission of the instructor.

**EVR 6406 U.S. Endangered Species Management (3).** History and implementation of the U.S. Endangered

Species Act. Topics include legal and administrative aspects, reauthorization, procedures for recovery planning and conflict resolution, and biological measures of success. Prerequisites: EVR 5355 or permission of the instructor.

**EVR 6950 Graduate Seminar (1).** A weekly seminar that features guest speakers, student presentations, and discussions among graduate students and faculty. Environmental Studies graduate students are required to register during three semesters of their program. Prerequisite: Permission of the instructor.

**EVR 6970 Supervised Research (1-12).** Supervised research toward completion of the student's program of study. Repeatable. Prerequisite: Permission of Major Professor.

**EVR 6971 Master's Thesis (1-12).** Completion of Master's Thesis. Repeatable. Prerequisite: Permission of Major Professor.

**EVR 7056 GIS in Water Resources (3).** Spatial analysis of watersheds and modeling of hydrological processes with emphasis on surface runoff, evapotranspiration and sub surface flow. Prerequisite: GIS 5050 or equivalent or permission of the instructor.

**EVR 7084 Interdisciplinary Environmental Studies (3).** Explores theoretical and practical approaches to interdisciplinary analysis of environmental issues, including sustainability science, ecological economics, and human-nature interactions. Prerequisites: EVR 5320 and EVR 5355 or equivalent or permission of the instructor.

**EVR 7322 Methods of Sustainable Resource Management (3).** A study of methods and policies for achieving a sustainable environment. Covers project appraisal, resource modeling and national accounts in the context of resource sustainability. Prerequisites: Graduate standing or permission of the instructor.

**EVR 7329 Watershed Analysis and Management (3).** An examination of the watershed approach to managing water and land resources. Integrating fundamental physical, chemical, and biological processes with human systems at the landscape scale using GIS.

**EVR 7445 Public Land Management (3).** Examines the historical, administrative, and legal settings that have predisposed various resource management agencies to succeed or fail in protecting public lands. Explores new and integrated approaches to building consensus on public land management issues. Prerequisites: EVR 5320, EVR 5355, equivalent or permission of the instructor.

**EVR 7980 Ph.D. Dissertation (3).** Research directed towards completion of the doctoral dissertation. To be taken every semester by the candidates if the Ph.D. Prerequisite: Permission of the major professor.

**EVS 6145 Ecotoxicology (3).** Fate of chemicals and their acute and chronic toxicological effects on aquatic and wildlife systems. Dose-response relationships, bioavailability, bioconcentration, microbial degradation, and biomonitoring. Prerequisites: One year of biology and one year of chemistry and CHM 2200 and lab or permission of the instructor.

**EVS 6194 Applied Soil Biology (3).** Examines biology of soil organisms and biologically-mediated chemical

transformations occurring in soil ecosystems. Prerequisite: BSC 1011.

**EVS 6637 Ecological Risk Assessment (3).** Evaluation of risks of foreign chemicals to aquatic and terrestrial systems. Concepts and methodology used in the hazard and risk assessment of toxic effluents, chemical/oil spills, and contaminated sediments. Prerequisites: One year of biology and one year of chemistry and CHM 2200 and lab or permission of the instructor.

**GIS 5050 Environmental GIS (3).** Concepts of GIS, database design and management, advanced spatial analysis and modeling, uncertainty, error, and sensitivity in GIS. Focus on GIS project design, execution and presentation using ArcGIS. Prerequisite: Permission of the instructor.

**GLY 5021 Earth Sciences for Teachers (3).** Study of geological materials and processes, as covered in Physical Geology, but at a higher level and with additional assignments. Prerequisite: Permission of the instructor. Corequisite: GLY 5021L. (F,S,SS)

**GLY 5021L Earth Sciences for Teachers Laboratory (1).** Study of the properties of minerals and rocks; interpretation of topographic and geologic maps; study of the geology of Florida, including field trips. Prerequisite: Permission of the instructor. Corequisite: GLY 5021. (F,S,SS)

**GLY 5060 Planet Earth: Dynamic Earth (1).** Essentials of metamorphism, rock rheology, seismology, plate tectonics, plate boundaries, plate movement, continental rifting and evolution of mountain belts.

**GLY 5107 Planet Earth: Evolving Earth (1).** Essentials of lithostratigraphy, biostratigraphy, geologic time scale, modern sedimentological processes, sedimentary rocks, evolution and extinction events, paleoenvironments and paleoclimates.

**GLY 5108 Paleoenvironments (3).** Sedimentary environments, paleoecology of fossils, skeletal mineralogy, marine paleoenvironmental changes, global patterns of change through time. Prerequisite: Permission of the instructor.

**GLY 5158 Florida Geology (3).** Detailed lithostratigraphic and biostratigraphic analyses of Southeast Florida and their relationship to tectonics, paleoclimates. Prerequisites: GLY 4511 and GLY 4511L. (S in alternate years)

**GLY 5159 Planet Earth: South Florida (1).** Geology, water resources and geologic environments of South Florida.

**GLY 5195 Topics in Paleoclimatology (3).** Broad concepts in paleoclimatology are reviewed and discussed. Topics include climate models, Quaternary climates, dating and pre-Quaternary climates. Prerequisite: Permission of the instructor.

**GLY 5245 Water-Rock Interaction (3).** Survey of geochemical processes at the water-rock interface. Topics include absorption of inorganic and organic ions, colloid stability in groundwater, mineral dissolution and precipitation. Prerequisites: CHM 1046, MAC 3312, GLY 4822 or permission of the instructor.

**GLY 5246 Geochemistry (3).** **GLY 5246L Geochemistry Lab (1).** Origin of chemical elements and principles affecting their distribution in the solar system, solid earth and hydrosphere. Use of chemical data to solve geologic problems. Prerequisites: Physical Geology and General Chemistry. (S in alternate years)

**GLY 5266 Stable Isotope Biogeochemistry (3).** Application and theory of stable isotope approaches to biogeochemistry. Topics: Introduction to IRMS machines, C/N/O/H/S (biogeochem. processes), sampling/lab. prep., and recent advances. Prerequisites: One year of chemistry or permission of the instructor.

**GLY 5283C Application of ICPEs in Geochemistry (3).** Determination of elemental abundances in rocks, soils, natural water using inductively coupled plasma emission spectroscopy (ICPEs). Instrumental principles, sample selection and preparation methods and application of results to research. Prerequisites: CHM 1045, CHM 1046 or permission of the instructor. (S or SS)

**GLY 5286 Research Instrumentation and Techniques in Geology (3).** Survey of techniques and instrumentation used in geological research, including computing and data handling. Prerequisites: Graduate standing or permission of the instructor. Corequisite: GLY 5286L. (F)

**GLY 5286L Research Instrumentation and Techniques in Geology Lab (1).** Introduction to advanced instrumentation and analytical techniques in Geology, including computing and data processing. Prerequisites: Graduate standing or permission of the instructor. Corequisite: GLY 5286. (F)

**GLY 5287C Scanning Electron Microscopy with EDS Analysis (3).** Imaging and microanalysis of materials using SEM including EDS. Prerequisite: Permission of the instructor.

**GLY 5288C Electron Microprobe Microanalysis with EDS Analysis (3).** Imaging and analysis of geological and other materials using electron microprobe with EDS analysis. Prerequisite: Permission of the instructor.

**GLY 5298 Topics in Geochemistry (3).** Seminar covering current research in selected areas of low-temperature geochemistry: oceans and oceanic sediments; continental waters and sediments; hydrothermal systems. Prerequisites: GLY 5246 or permission of the instructor. (F)

**GLY 5322 Igneous Petrology and Geochemistry (3).** Presentation and discussion of current topics in igneous petrology and geochemistry in a seminar format. Prerequisite: Permission of the instructor. (S)

**GLY 5329 Planet Earth: Solid Earth (1).** Essentials of the formation and evolution of the crust mantle and core of the earth. Composition and physical properties. Generation of magmas, their geochemistry.

**GLY 5335 Metamorphic Geology (3).** Metamorphic mineralogy; characteristics of low, medium and high pressure metamorphic rocks; pressure-temperature determinations; metamorphic textures; modeling and determination of P-T-t paths. (F)

**GLY 5335L Metamorphic Geology Lab (1).** Petrographic examination of metamorphic rocks. (F)



**GLY 5346 Sedimentary Petrology (3).** Systematic study of sedimentary rocks. Special emphasis on genetical aspects, geochemistry, paleontology, mineralogy, and microfacies. Emphasizes microscopic study. Prerequisite: GLY 4551. Corequisite: GLY 5346L. (F in alternate years)

**GLY 5346L Sedimentary Petrology Lab (1).** Laboratory studies of sediments and sedimentary rocks with emphasis on microscopic analyses and geochemical techniques. Prerequisites: GLY 4551 and GLY 4551L. Corequisite: GLY 5346. (F in alternate years)

**GLY 5408 Advanced Structural Geology (3).** Advanced treatment of the theory of rock mechanics to solve problems of natural rock deformation. Prerequisites: GLY 4400, MAC 3413, or permission of the instructor. Corequisite: GLY 5408L. (S)

**GLY 5408L Advanced Structural Geology Lab (1).** Problem solving in theory of rock deformation. Experimental procedures in rock mechanics. Corequisite: GLY 5408. (S)

**GLY 5415 Caribbean Geology and Tectonics (3).** Integration of geologic and geophysical data to understand the evolution and present tectonic configuration of the Caribbean area. Prerequisite: Permission of the instructor.

**GLY 5425 Tectonics (3).** Properties of the lithosphere; plate kinematics and continental drift; characteristics of plate boundaries; mountain belts; formation of sedimentary basins. Prerequisites: GLY 1010, 1100, 4400, 4300, 3202 or permission of the instructor. (S)

**GLY 5457 Geophysical Data Analysis (3).** Computer analysis and modeling of geophysical data and digital images. Statistical description of data, linear inverse theory, digital signal and image processing. Computer exercises with MATLAB. Prerequisites: GLY 4450, MAP 2302, MAS 3105, PHY 2048, PHY 2049 or permission of the instructor. Corequisite: GLY 5457L. (F)

**GLY 5457L Analysis of Geophysical Data Lab (1).** Field and laboratory applications of geophysical techniques. Computer aided analysis and three-dimensional modeling of gravity and magnetic data. Prerequisites: GLY 4450, PHY 2048, PHY 2049, MAC 2311, MAC 2312, MAP 2302. Corequisite: GLY 5457. (F)

**GLY 5495 Seminar in Geophysics (3).** Detailed investigation of current geophysical techniques, including topics on instrument design. Prerequisites: GLY 5457 or permission of the instructor. (S)

**GLY 5497 Topics in Structural Geology and Tectonics (3).** Selected advanced topics in structural geology and rock deformation. Latest advances in crustal tectonics. Prerequisite: GLY 5408. (S)

**GLY 5599 Seminar in Stratigraphy (3).** Discussion of research projects and/or current literature in stratigraphic correlation as derived from sedimentologic principles and biozonation. Prerequisite: GLY 5346. (F,S)

**GLY 5608 Advanced Paleontology I (3).** Discussion of current literature and research projects on evolution, systematics functional morphology, with reports by members of the seminar. Prerequisites: GLY 4650 or permission of the instructor. (F)

**GLY 5621 Caribbean Stratigraphic Micropaleontology (3).** Microscopic study of biostratigraphic type sections

from the Caribbean area. Emphasis on planktonic foraminifera and radiolaria, paleoecologic and paleoclimatic interpretations. Prerequisites: GLY 4650 or permission of the instructor. (F)

**GLY 5628 Radiogenic Isotope Methods (3).** Theory and practice of radiogenic isotope ratio measuring techniques. Use of class-100 clean room facilities, and introduction to thermal ionization mass spectrometry. Prerequisite: General Chemistry.

**GLY 5655 Topics in Paleobiology (1-3).** Various concepts in paleobiology are reviewed and discussed, based on readings of the literature, including journal articles and books. Prerequisite: Permission of the instructor.

**GLY 5710 Watershed Hydrology (3).** Hydrologic processes on watershed, water budgets, effects on water quality, field investigative methods using tracers and hydrometric measurements, hydrologic and hydro-chemical models.

**GLY 5754 Applied Remote Sensing in the Earth Sciences (3).** Application of remote sensing and image analysis in the earth sciences; qualitative and quantitative satellite image and air photo interpretation. Emphasis is on use of computer processing packages. Prerequisites: GLY 1010 or permission of the instructor.

**GLY 5758 GIS and Spatial Analysis for Earth Scientists (3).** Application of GIS technology to spatial problems in the Earth Sciences. Topics include: spatial statistics, sampling theory, surface estimation, map algebra, and suitability modeling.

**GLY 5785 Caribbean Shallow-Marine Environments (3).** Field study of multiple tropical environments in the Caribbean area. Dynamic processes and coastal evolution in response to natural and human-induced changes.

**GLY 5786 Advanced Field Excursion (3).** A study of the geology of a selected region of the world followed by 10-12 day field trip in order to study the field relationships of the geologic features. Special emphasis is given to stratigraphic, structural and tectonic relationships of lithic package. Prerequisite: Permission of the instructor. (SS)

**GLY 5808 Mining Geology (3).** Application of theoretical models of ore formation to exploration and the use of geochemical and geophysical techniques in the search for ore deposits. Prerequisites: GLY 4300 and CHM 1046. (F)

**GLY 5816 Economic Geology (3).** Economically important metal deposits of sedimentary, igneous and hydrothermal origins and their geologic settings and characteristics. Prerequisites: GLY 1010, GLY 4300, CHM 1045, CHM 1046. (S)

**GLY 5826 Hydrogeologic Modeling (3).** Techniques used in modeling groundwater flow and solute transport in geologic systems. Case studies of significant aquifers. Prerequisites: GLY 5827, MAP 2302, or permission of the instructor. (S,SS)

**GLY 5827 Hydrogeology (3).** Physics of flow in geological media. Saturated and unsaturated flow, groundwater and the hydrologic cycle, estimating hydraulic parameters of aquifers, introduction to chemical transport. Prerequisites: GLY 1010, MAC 2312, and PHY 2053, or permission of the instructor. (F)

**GLY 5827L Hydrogeology Lab (1).** Laboratory, field, and computer exercises to complement GLY 5827. (F)

**GLY 5828 Chemical Hydrogeology and Solute Transport (3).** Quantitative analysis of hydrologic, geologic, and chemical factors controlling water quality and the transport and fate of organic and inorganic solutes in the subsurface. Prerequisite: GLY 5827. (S)

**GLY 5834 Field Hydrogeology (3).** Field methods in hydrogeology. Drilling, logging, wells, data loggers, hydraulic conductivity/transmissivity measurements, purging, field chemistry parameter measurements, sampling methods. Prerequisites: GLY 4822 or permission of the instructor.

**GLY 5835 Introduction to Lattice Boltzmann Methods (3).** The course will provide an introduction to Lattice Boltzmann methods for fluid dynamics simulation. Emphasis on multiphase fluids. Prerequisites: Programming skills, graduate standing, permission of the instructor.

**GLY 5889 Geology for Environmental Scientists and Engineers (3).** Characterization of rocks and rock masses; geological maps; seismic hazards; weathering of rocks; hydrologic cycle; slope stability; coastal processes; geophysical techniques. Course includes field trips in the South Florida region. Prerequisites: CHM 1045, GLY 1010 or permission of the instructor.(S)

**GLY 5931 Graduate Seminar (1).** Presentation or critical examination of current research problems in geology. A selection of topics is considered each term. Topics may also include individual research in the student's field of investigation. Prerequisites: Graduate standing or permission of the instructor. (F,S,SS)

**GLY 6159 Stratigraphy of the Circum Caribbean Region (4).** Detailed lithostratigraphic and biostratigraphic analyses of Caribbean islands, Central America, northern South America and Caribbean basin. Prerequisites: GLY 5621 or permission of the instructor. (SS)

**GLY 6247 Trace Element and Isotope Geochemistry (3).** Principles of trace element and isotope fractionation and radioactive decay, and their application to the interpretation of igneous rocks and the chemical evolution of the earth. Prerequisites: GLY 5246 or permission of the instructor. Corequisite: GLY 6247L. (S)

**GLY 6328 Advanced Igneous Petrology (3).** Interpretation of igneous rocks; chemistry and physics of magma generation and crystallization; origin of major igneous rock series with emphasis on tectonic controls. Prerequisite: Permission of the instructor. Corequisite: GLY 6328L. (S)

**GLY 6328L Advanced Igneous Petrology Lab (1).** Identification of rocks using microscopic and microprobe techniques. Prerequisite: Permission of the instructor. Corequisite: GLY 6328. (S)

**GLY 6337 Metamorphic Phase Equilibria (3).** Theory and methods of calculation of metamorphic phase equilibria and P-T paths using appropriate analysis of composition space, activity models, geothermometry, geobarometry. Origin and interpretation of zoning in metamorphic minerals. Prerequisites: GLY 5335 or permission of the instructor. (F)

**GLY 6345 Sedimentary Petrography (3).** Comparative study and fundamental observations of sedimentary rocks in hand specimens and under the petrographic microscope; their classification, theoretical and practical implications. Prerequisites: GLY 4551 or permission of the instructor. (F)

**GLY 6345L Sedimentary Petrography Laboratory (1).** Laboratory studies of sedimentary rocks in thin section. Prerequisites: GLY 4551 or permission of the instructor. Corequisite: GLY 6345. (F)

**GLY 6353 Microfacies Analysis (3).** **GLY 6353L Microfacies Analysis Laboratory (1).** Identification and interpretation of the fossil and mineralogical constituents of sedimentary rocks in thin section. Emphasis is placed on the paleoecological significance of fossil remains in carbonates. Prerequisites: GLY 4551 or permission of the instructor. (S)

**GLY 6392 Topics in Igneous Petrology and Geochemistry (3).** Research seminar in contemporary petrology and geochemistry. Student presentation on thesis research. Prerequisites: GLY 5322 or permission of the instructor. (F,S)

**GLY 6427 Quantitative Geotectonics (3).** Application of continuum mechanics and heat transfer to problems in geology. Observational constraints on earth properties. Emphasis is on problems relating to the earth's lithosphere. Prerequisites: GLY 4450, GLY 4400, GLY 5425 and MAP 2302 or permission of the instructor. (F in alternate years)

**GLY 6444 Quantitative Analysis of Joints and Faults (3).** Application of fracture mechanics to geologic problems, including the analysis of local and regional stress fields, bedrock fracture systems, estimation of fracture related strain, and the influence of mechanical properties on rock failure. Prerequisites: GLY 4400, GLY 4450, GLY 5425 or permission of the instructor. (F in alternate years)

**GLY 6447 Advanced Topics in Structural Geology and Tectonics (3).** Detailed exploration of selected research topics in structural geology and tectonics. Prerequisites: GLY 5408 or permission of the instructor. (F,S)

**GLY 6448 Stress in the Earth's Crust (3).** The distribution and magnitude of stress in the earth's crust, laboratory derived values for earth stress, in situ stress measurements, regional stress patterns and sources of stress in the lithosphere. Prerequisites: GLY 4400, GLY 4450, GLY 5425 or permission of the instructor. (S)

**GLY 6468 Paleomagnetism (3).** Physics of rock and mineral magnetism, geomagnetism and paleomagnetism; field and laboratory methods, geomagnetic field behavior, magnetostratigraphy, apparent polar wander. Prerequisites: GLY 4400, GLY 3202 or permission of the instructor. Corequisite: GLY 6468L. (F)

**GLY 6468L Paleomagnetism Laboratory (1).** Physics of rock and minerals magnetism, geomagnetism and paleomagnetism; field and laboratory methods, geomagnetic field behavior, magnetostratigraphy, apparent polar wander. Prerequisites: GLY 4400, GLY 3202 or permission of the instructor. Corequisite: GLY 6468. (F)

**GLY 6485 Physics of the Earth (3).** Properties and dynamics of the Earth's interior studied from a physical

perspective. Topics include heat flow, fluid flow, earthquake seismology. Prerequisites: GLY 4450 and MAC 2313. (F)

**GLY 6496 Advanced Topics in Geophysics (3).** Discussion of research projects and current literature in geophysics. Prerequisite: GLY 5495. (S)

**GLY 6517 Basin Analysis (3).** Analysis of sedimentary basins based on their origin, paleogeographic evolution and tectonic setting. Emphasis is placed on the tectonic evolution and economic potential of sedimentary basins. (S in alternate years)

**GLY 6517L Basin Analysis Lab (1).** Analysis of different types of sedimentary basins using a case history approach. Corequisite: GLY 6517. (S in alternate years)

**GLY 6595 Topics in Sedimentology (3).** Oral presentation by students of research projects and survey of relevant literature with reports by members of the seminar. Prerequisite: GLY 5346. (S in alternate years)

**GLY 6626 Stratigraphic Micropaleontology: Foraminifera (3).** Nomenclature, taxonomy, and biostratigraphy of Cretaceous and Cenozoic planktonic foraminifera. Studies of stratigraphically important taxa from Caribbean land sections, piston cores, and DSDP/ODP sites. Prerequisites: GLY 5621 or permission of the instructor. (F in alternate years)

**GLY 6627 Stratigraphic Micropaleontology: Radiolaria (3).** Nomenclature, taxonomy and biostratigraphy of Cretaceous and Cenozoic radiolaria. Studies of stratigraphically important taxa using Caribbean land sections, piston cores, and DSDP/ODP sites. Prerequisites: GLY 5621 or permission of the instructor. (S in alternate years)

**GLY 6628 Stratigraphic Micropaleontology: Calcareous Nannofossils (3).** Nomenclature, taxonomy, and biostratigraphy of triassic to recent nannofossils. Intensive training of identification of marker taxa using land and DSDP/ODP sites. Prerequisites: GLY 5621 or permission of the instructor. (S in alternate years)

**GLY 6690 Topics in Paleontology (3).** Oral presentation and discussion of current research projects and relevant literature, with reports by members of the seminar. Prerequisites: GLY 5608 or permission of the instructor. (F)

**GLY 6809 Hydrothermal Geochemistry (3).** The mineralogy, thermodynamics, chemistry and isotope chemistry of hydrothermal and geothermal systems, with an emphasis on the transport of solutes in hydrothermal solutions and ore-forming processes. Prerequisites: GLY 5246, CHM 3400 or permission of the instructor. (S in alternate years)

**GLY 6817 Topics in Economic Geology (3).** Current research directions in Economic Geology and Geochemistry, including ore formation processes, exploration and remediation.

**GLY 6862 Numerical Methods in the Earth Sciences (3).** Numerical techniques used by geoscientists, with emphasis on finite-difference and finite-element techniques to solve equations governing fluid flow and mass transport in geological systems. Prerequisites: MAP

2302, GLY 5827 and knowledge of one programming language or permission of the instructor.

**GLY 6896 Advanced Topics in Hydrology (1-3).** Research-oriented seminar course involving analysis of several contemporary topics chosen from the current literature in hydrology. Specific topics vary. May be repeated. Prerequisites: GLY 5827 and one other graduate level hydrology/hydrogeology course, or permission of the instructor. (S in alternate years)

**GLY 6910 Supervised Research (1-12).** Research apprenticeship under the direction of a professor or a thesis advisor. Prerequisites: Full graduate admission and permission of the instructor.

**GLY 6931 Advanced Graduate Seminar (1).** Oral presentation and discussion by students of an assigned literature survey, with reports by members of the seminar. Prerequisites: GLY 5931 or permission of the instructor. (F,S)

**GLY 6941 Supervised Teaching in the Geosciences (1).** Teaching a geological discipline under the supervision of departmental faculty. Prerequisite: Graduate standing.

**GLY 6945 Proposal Writing (1).** A graduate course aimed at introducing students to grant proposal writing.

**GLY 6949 Professional Internship in Earth Science (1-3).** Semester or summer term of supervised work at an approved government or industry laboratory or field station. Prerequisite: Graduate standing.

**GLY 6966 Master's Comprehensive Examination (0).** Oral and written examinations on knowledge in general geology and the student's field of concentration. Schedule to be selected in consultation with the Graduate Committee. Prerequisite: Advanced graduate standing. (F,S,SS)

**GLY 6971 Master's Thesis (1-12).** Field and/or laboratory research project toward thesis. Selected in consultation with major professor. Prerequisite: Permission of the major professor. (F,S,SS)

**GLY 7980 Ph.D. Dissertation (1-12).** Field and/or laboratory research directed towards completion of the doctoral dissertation. Selected in consultation with major professor. Prerequisite: Permission of the Major Professor and Doctoral Candidacy. (F,S,SS)

**MET 5305 Boundary Layer Meteorology (3).** General survey of boundary meteorology. Topics include atmospheric boundary layer, (ABL), role in exchange and circulation, use in interpreting wind, temperature, and moisture distribution, hurricane boundary layer wind, and turbulent structures. Prerequisites: PHY 2048 and PHY 2049.

**MET 5311 Dynamic Meteorology I (3).** To study atmospheric phenomena on a rotating planet. It intends to lead towards an understanding of the theories of the atmospheric motion by applying concepts of Math., thermodynamics, and dynamics. Prerequisites: PHY 2048, PHY 2049.

**MET 5530 Hurricane Meteorology and Impacts (3).** Hurricane formation, motion, and impacts on the graduate level. Adds critical reading of the scientific and disaster literatures and quantitative problem sets to the

undergraduate experience. Prerequisite: Permission of the instructor.

**OCG 6105 Advanced Marine Geology (3). OCG 6105L Advanced Marine Geology Lab (1).** Application of geophysical and geological data to the interpretation of the earth's crust under the oceans, including the data provided by the Deep-Sea Drilling Project, dredging, piston-coring, gravity magnetism, and seismicity. Special emphasis will be given to the genesis and evolution of the Atlantic and Caribbean margins, and their potential for oil resources. Prerequisites: GLY 4730 or permission of the instructor. (F in alternate years)

**OCG 6664 Paleoceanography (3).** Mesozoic/Cenozoic development of the major ocean basins, their circulation and sedimentation history. Use of micropaleontologic and stable isotopic techniques in paleoceanographic analysis. Prerequisites: GLY 4730 or permission of the instructor. (F in alternate years)

**SWS 5305 Advanced Soil Resources Analysis (3).** A review of soil science concepts: analysis of physical and chemical properties of soils and nutrient cycling, emphasizing the soils of South Florida. Prerequisites: BSC 1010, BSC 1011, CHM 2210, CHM 2211; or permission of the instructor.