

Earth and Environment

Leonard Scinto, Associate Professor and Chairperson

Dean Whitman, Professor and Associate Chairperson

Elizabeth Anderson, Associate Professor

William Anderson, Professor and Associate Vice

President, Office of Research and Economic
Development

Maruthi Sridhar B. Bhaskar, Associate Professor

Mahadev Bhat, Professor

Jesse Blanchard, Assistant Teaching Professor

Jessica Bolson, Assistant Teaching Professor

David Bray, Professor

Robert Burgman, Associate Professor

Laurel Collins, Professor

Grenville Draper, Professor

Tatiana Gaona-Narvaez, Assistant Teaching Professor

Stephen Haggerty, Distinguished Research Professor

Joel Heinen, Professor

Rosemary Hickey-Vargas, Emeritus Professor

Patricia Houle, Teaching Professor

Krishnaswamy Jayachandran, Distinguished University
Professor

Clinton Jenkins, Associate Professor

Haiyan Jiang, Professor

Amir A. Khoddamzadeh, Associate Professor and
Undergraduate Program Director

Stephen P. Leatherman, Professor

Hong Liu, Professor

Andrew Macfarlane, Associate Professor

Florentin Maurrasse, Professor

Assefa Melesse, Professor and Graduate Program
Director

Pallab Mozumder, Professor

Paulo Olivas, Assistant Professor

John Parker, Emeritus Professor

Thomas Pliske, Emeritus Teaching Professor

René Price, Professor

Kathleen Quardokus Fisher, Associate Professor

Gary Rand, Emeritus Professor

Rodolfo Rego, Associate Teaching Professor

Jennifer Rehage, Professor

James Riach, Associate Teaching Professor

Michael Ross, Professor

Kateel Shetty, Associate Research Professor

Neptune Srimal, Teaching Professor

Michael Sukop, Professor

Tiffany Troxler, Associate Professor

Shimon Wdowinski, Professor

Hugh Willoughby, Distinguished Research Professor

Ping Zhu, Professor

Knowledge of the Earth and its environments is essential for successful stewardship of our home planet. The mission of FIU's 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 events such as earthquakes, volcanic eruptions and floods, and human-

made problems such as oil spills, ecosystem degradation and soil erosion. The Department of Earth and Environment has well-equipped facilities that allow students to understand the Earth and its environments and to prepare for professions with environmental, geoscientific and natural resource orientations.

Geoscience and Earth Science Programs

The Department offers a rigorous, broad-based Bachelor of Sciences degree program in Geosciences with a choice of majors in Geological Sciences or Atmospheric Sciences or Geoinformatics. These majors have been designed to prepare students to gain professional credentials such as the State of Florida Professional Geologist certification, the American Meteorological Society certification or the GISP Certified GIS Professional certification. An interdisciplinary Bachelor of Arts program in Earth Sciences is also offered, including a major in Earth Science Education which leads to teacher certification in Florida. Also available are Minors in Geology and Meteorology. A grade of "C" or better is required for all required courses in the major and/or minor.

Bachelor of Science in Geosciences

Degree Program Hours: 120

Lower Division Preparation

Common Prerequisite Courses

For a list of all state-approved common prerequisites, including alternatives, visit <https://cpm.flvc.org>.

Lower Division Common Prerequisites

ESC 1000	Introduction to Earth Sciences	3
ESC 1000L	Introduction to Earth Sciences Lab	1
or		
GLY 1010	Physical Geology* &	3
GLY 1010L	Physical Geology Lab	1
or		
GLY 3039	Environmental Geology &	3
GLY 3039L	Environmental Geology Lab	1
and		
CHM 1045	General Chemistry I &	3
CHM 1045L	General Chemistry I Lab	1
CHM 1046	General Chemistry II &	3
CHM 1046L	General Chemistry II Lab	1
MAC 2311	Calculus I	4
and		
PHY 2048 ¹	Physics with Calculus I**	4
or		
PHY 2053 ¹	Physics without Calculus I**	4
and		
PHY 2049 ¹	Physics with Calculus II**	4
or		
PHY 2054 ¹	Physics Without Calculus II**	4
and		
PHY 2048L	General Physics Lab I	1
PHY 2049L	General Physics Lab II	1

*GLY 1010: *Physical Geology is strongly recommended for the Geological Sciences Major*

****Physics with Calculus is strongly recommended for the Atmospheric Sciences major**

***The choice of Physics sequence depends on the area of Geology specialization**

Additional Required Lower Division Courses

MAC 2312	Calculus II	4
ISC 1056	First Year Seminar in Earth and Environment	1

For the Geological Sciences Major Only

BSC 2011	General Biology II &	3
BSC 2011L	General Biology II Lab	1
or		
GLY 1101	The History of Life &	3
GLY 1101L	The History of Life Laboratory	1

For the Atmospheric Sciences Major Only

MAC 2313	Multivariable Calculus	4
MAP 2302	Differential Equations	3

For the Geoinformatics Major

Only One of the following 3-credit courses:

STA 2023	Statistics for Business and Economics	3
STA 2122	Statistics for Behavioral and Social Sciences I	3
STA 3111	Statistics I	3

Upper Division Requirements

Geosciences Essentials (13 credits)

GLY 3112	Earth Through Time*	3
GLY 4822	Introduction to Hydrogeology	3
MET 3003	General Meteorology	3
OCP 3002	Physical Oceanography	3
ISC 4935	Senior Seminar in Earth and Environmental Science	1

[*Students may substitute Historical Geology from another institution.]

Geological Sciences Major (25 credits)

1. Complete all courses (with labs as necessary) from List 1 (16 credits)
2. Choose one field experience course from List 2 (3 credits minimum). May be substituted with a 3 or more credit field course from another university
3. Choose an additional 6 credits or more from Lists 2 or 3

List 1: Major-specific Courses

GLY 3202	Earth Materials	3
GLY 3202L	Earth Materials Lab	1
GLY 4300	Petrology	3
GLY 4300L	Petrology Lab	1
GLY 4400	Structural Geology	3
GLY 4400L	Structural Geology Lab	1
GLY 4511	Stratigraphy	3
GLY 4511L	Stratigraphy Lab	1

List 2: Field Experience Courses

GLY 3782	Geology Field Excursion	3
GLY 3881	Environmental Geology Field Methods	3
GLY 4791	Field Geology and Geologic Mapping	3

List 3: Geo-elective Courses

EVR 4592	Soils and Ecosystems	3
GLY 3034	Natural Disasters	3
GLY 3759	Visualizing Our World With GIS	3
GLY 4660	Paleoecology	3

GLY 4730	Marine Geology	3
GLY 4734	Changing Coastlines – GL	3
GLY 4812	Introduction to Ore Deposits	3
GLY 4881	Coastal Hazards – GL	3
GLY 4947	Internship in Geoscience	0-6
GLY 4970	Geology Honors Thesis	3
GLY 4989L	Geology Honors Research	1-3
ISC 4940	Undergraduate Research Internship in Earth and Environment	0-6
MET 3103	Planetary Climate Change	3
MET 4304	Introduction to Boundary Layer Meteorology	3
MET 4532	Hurricanes	3

Any other unused course listed in the upper division requirements of the Atmosphere Sciences or Geoinformatics majors may also be used for Geo-electives List 3. Other courses approved by the Program Director may also be used in this list.

Atmospheric Sciences Major (25 credits)

1. Complete all courses (with labs as necessary) from List 1 (16 credits)
2. Choose one course from List 2 (3 credits)
3. Choose one course from List 3 (2 or 3 credits)
4. Choose one or more additional classes from Lists 2-4 to meet the total credits required.

List 1: Major-specific Courses

MET 3502	Synoptic Meteorology	3
MET 3502L	Synoptic Meteorology Lab	1
MET 4301	Dynamic Meteorology I	3
MET 4302	Dynamic Meteorology II	3
MET 4102	Physical Climatology	3
MET 4420	Physical Meteorology	3

List 2: Remote Sensing and Instrumentation Courses

MET 4400	Meteorological Instrumentation & Observations	3
MET 4410	Remote Sensing: Radar and Satellite Meteorology	3

List 3: Additional Weather Forecasting Courses

MET 4300	Severe Weather	3
MET 4521	Advanced Forecasting	2
MET 4520L*	Practical Forecasting*	1

*MET4520L Practical Forecasting must be taken twice to fulfill the requirement of at least 2 credits from List 3.

List 4: Geo-elective Courses

GLY 3034	Natural Disasters	3
GLY 3759	Visualizing Our World With GIS	3
GLY 4730	Marine Geology	3
GLY 4734	Changing Coastlines – GL	3
GLY 4812	Introduction to Ore Deposits	3
GLY 4881	Coastal Hazards – GL	3
ISC 4940	Undergraduate Research Internship on Earth and Environment	0-6
MET 4304	Introduction to Boundary Layer Meteorology	3
MET 4532	Hurricanes	3
MET 4912L	Meteorology Honors Research	1-3
MET 4941	Internship in Meteorology	0-3
MET 4970	Meteorology Honors Thesis	1-6

Any other unused course listed in the upper division requirements of the Geological Sciences or Geoinformatics majors may also be used for Geo-electives List 4. Other courses approved by the Program Director may also be used in this list.

Geoinformatics Major (25 credits)

1. Complete all courses from List 1 (7 credits)
2. Choose three courses from List 2 (9 credits)
3. Choose one course from List 3 (3 credits)
4. Choose an additional 6 credits from Lists 2-4

List 1: GIS Fundamentals

GIS 3043	Introduction to GIS	4
GLY 3754	Remote Sensing in the Earth Sciences	3

List 2: Major Specific Courses

GIS 4119	Building Geodatabases	3
GIS 4390	Advanced Spatial Analysis	3
GLY4450	Exploration Geophysics	3
MET 4750	Techniques in Earth System Modeling	3
MET 4410	Remote Sensing in Meteorology	3

List 3: Field Methods

GIS 4303	Geospatial Measurement Techniques	3
GLY 3782	Geology Field Excursion	3
GLY 3881	Environmental Geology Field Methods	3

List 4: Geo-elective Courses

GLY 3034	Natural Disasters	3
GLY 3759	Visualizing Our World With GIS	3
GLY 4730	Marine Geology	3
GLY 4734	Changing Coastlines – GL	3
GLY 4812	Introduction to Ore Deposits	3
GLY 4881	Coastal Hazards – GL	3
ISC 4940	Undergraduate Research Internship on Earth and Environment	1-6
GLY 4947	Internship in Geoscience	1-6
GLY 4970	Geology Honors Thesis	3
GLY 4989L	Geology Honors Research	1-3
MET 4304	Introduction to Boundary Layer Meteorology	3
MET 4532	Hurricanes	3

Any other unused course listed in the upper division requirements of the Geological Sciences or Atmospheric Sciences majors may also be used for Geo-electives List 4. Other courses approved by the Program Director may also be used in this list.

Combined BS/MS in Geosciences Degree Pathway

The combined BS/MS degree pathway in Geosciences allows qualified students to earn both the BS in Geosciences and a non-thesis MS in Geosciences in a shorter amount of time than typically required for earning degrees sequentially. The accelerated pathway is designed for highly qualified undergraduate students in the Department of Earth and Environment.

To be considered for admission to the combined bachelor's/master's degree pathway, students must have completed at least 75 credit hours including all lower division requirements, typically have at least 30 credit hours remaining in the program and meet the admissions criteria for the graduate degree program to which they are applying. Students need only apply once to the combined degree pathway; the application is submitted to Graduate

Admissions typically before the student starts the last 30 credits of the bachelor's degree program. A student admitted to the combined degree pathway will be considered to have undergraduate status until the student applies for graduation from their bachelor's degree program. 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

1. Current enrollment in the Bachelor of Science program in Geosciences at FIU.
2. Completed at least 75 credits of coursework (including UCC), and typically has 30 credits remaining.
3. Completion of all lower division required courses for the bachelors degree.
4. Minimum GPA of 3.2.
5. Official GRE scores.
6. Three letters of recommendation.
7. Approval by the Earth and Environment Graduate Committee.

General Requirements

1. Meet the requirements of both the BS and non-thesis MS degree in Geosciences.
2. Overlap of programs: 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.

Bachelor of Arts in Earth Sciences Degree Program Hours: 120

This program is for the student who requires a broad background in Earth Sciences for a career in science education or public or private administration dealing with Earth and environmental science issues.

Common Prerequisite Courses

For a list of all state-approved common prerequisites, including alternatives, visit <https://cpm.flvc.org>.

Lower Division Preparation

ESC 1000	Introduction to Earth Sciences	3
ESC 1000L	Introduction to Earth Sciences Lab	1
	or	
GLY 1010	Physical Geology &	3
GLY 1010L	Physical Geology Lab	1
	or	
GLY 3039	Environmental Geology &	3
GLY 3039L	Environmental Geology Lab	1
	and	
CHM 1045	General Chemistry I &	3
CHM 1045L	General Chemistry I Lab	1
CHM 1046	General Chemistry II &	3
CHM 1046L	General Chemistry II Lab	1
	and	
PHY 2048	Physics with Calculus I	4
	or	
PHY 2053	Physics without Calculus I	4
	and	
PHY 2049	Physics with Calculus II	4

	or		
PHY 2054	Physics without Calculus II	4	
and			
PHY 2048L	General Physics Lab I	1	
PHY 2049L	General Physics Lab II	1	
and			
MAC 1114	Trigonometry	3	
or			
MAC 1147	Pre-Calculus Algebra and Trigonometry	4	
And a choice of one of the following:			
MAC 2311	Calculus I	4	
STA 2023	Statistics for Business and Economics	3	
STA 2122	Statistics for Behavioral and Social Sciences I	3	
STA 3111	Statistics I	3	
Additional Required Lower Division Courses			
ISC 1056	First Year Seminar in Earth and Environment	1	
BSC 2011	General Biology II &	3	
BSC 2011L	General Biology Lab II	1	
Upper Division Program (32 credits minimum)			
List 1: Required (11 credits)			
GLY 3112	Earth Through Time*	3	
and			
GLY 3202	Earth Materials &	3	
GLY 3202L	Earth Materials Lab	1	
or			
MET 3502	Synoptic Meteorology &	3	
MET 3502L	Synoptic Meteorology Laboratory	1	
and			
OCE 3014	Oceanography – GL	3	
or			
OCP 3002	Physical Oceanography	3	
and			
ISC 4935	Senior Seminar in Earth and Environmental Science	1	
[*Students may substitute Historical Geology from another institution.]			
and			
List 2: THREE of the following (9-12 credits)			
GLY 4300	Petrology &	3	
GLY 4300L	Petrology Lab	1	
GLY 4400	Structural Geology &	3	
GLY 4400L	Structural Geology Lab	1	
GLY 4511	Stratigraphy &	3	
GLY 4511L	Stratigraphy Lab	1	
GLY 4822	Introduction to Hydrogeology	3	
MET 3003	General Meteorology	3	
MET 4102	Physical Climatology	3	
MET 4420	Physical Meteorology	3	
and			
List 3: TWO of the following (6-8 credits)			
EVR 3013	Ecology of South Florida &	3	
EVR 3013L	Ecology of South Florida Lab	1	
EVR 4211	Water Resources &	3	
EVR 4211L	Water Resources Lab	1	
EVR 4310	Energy Resources	3	
EVR 4592	Soils & Ecosystems	3	
GEO 3510	Earth Resources – GL	3	

GLY 3034	Natural Disasters	3
GLY 4881	Coastal Hazards – GL	3

and**Additional Courses (6-8 credits)**

Students take two approved upper division GLY (excluding GLY 3039), MET or EVR courses.

Earth Science Education Major

This program prepares students interested in Earth Sciences and science for certification to teach at the secondary level. Additional science and/or mathematic certifications at the secondary level may be added (below). Students are encouraged to contact the FIUteach program (FIUteach.fiu.edu) for opportunities to try out teaching at no cost. Interested students are encouraged to contact the department, the FIUteach program, or the secondary science advisor for additional details and certification requirements.

Additional coursework in science and or mathematics is required to prepare for certification in additional subject areas. Students must contact the FIUteach program or the secondary science advisor for details and requirements.

To qualify for admission to the program, undergraduate candidates must have met all the lower division requirements including: 60 credit hours of lower-division courses, all general education requirements, lower division GPA of 2.5 or higher, and achieve the competencies of the FTCE General Knowledge Exam (GK). All students must pass the GK Exam by the time they reach 72 credit hours in their program of study. All stated admission requirements are to be considered minimum. A student who meets these minimum requirements is not automatically assured admission. Program admission requirements are subject to change. It is the responsibility of the student to assure that he/she has met the requirements.

Lower Division Preparation**Common Prerequisites as Detailed Under the BA Degree in Earth Sciences**

For a list of all state-approved common prerequisites, including alternatives, visit <https://cpm.flvc.org>.

Additional Lower Division Courses (4)

AST 2003	Solar System Astronomy	3
AST 2003L	Solar System Astronomy Lab	1

and

SMT 2661	Step 1: Inquiry Approaches to Teaching Mathematics and Science	1
SMT 2662	Step 2: Inquiry-Based Lesson Design in Mathematics and Science	1

or

SMT 2044	Combined STEP 1 & 2: Inquiry-Based Approaches and Lesson Design for Teaching Mathematics and Science	2
----------	--	---

Upper Division Program (47 credits minimum)**List 1: Required (14 credits)**

GLY 3112	Earth Through Time*	3
GLY 3202	Earth Materials &	3

GLY 3202L	Earth Materials Lab	1
MET 3003	General Meteorology	3
and		
OCE 3014	Oceanography – <i>GL</i>	3
or		
OCP 3002	Physical Oceanography	3
and		
ISC 4935	Senior Seminar in Earth and Environmental Science	1

[*Students may substitute Historical Geology from another institution.]

and**List 2: ONE of the following (3-4 credits)**

GLY 4300	Petrology &	3
GLY 4300L	Petrology Lab	1
GLY 4400	Structural Geology &	3
GLY 4400L	Structural Geology Lab	1
GLY 4511	Stratigraphy &	3
GLY 4511L	Stratigraphy Lab	1
GLY 4822	Introduction to Hydrogeology	3

and**List 3: ONE of the following (3-4 credits)**

EVR 3013	Ecology of South Florida &	3
EVR 3013L	Ecology of South Florida Lab	1
EVR 4211	Water Resources &	3
EVR 4211L	Water Resources Lab	1
EVR 4310	Energy Resources	3
EVR 4592	Soils & Ecosystems	3
GEO 3510	Earth Resources – <i>GL</i>	3
GLY 3034	Natural Disasters	3
GLY 4881	Coastal Hazards – <i>GL</i>	3

and**List 4: Education Courses (27 credits)**

ISC 3523	Research Methods	3
RED 4325	Subject Area Reading	3
SCE 4194	Perspectives in Science and Math Education – <i>GL</i>	3
SCE 4944	Student Teaching	6
SMT 3100	Knowing and Learning in Mathematics and Science	3
SMT 4301	Classroom Interactions in Mathematics and Science Teaching	3
SMT 4664	Problem-Based Instruction (PBI) in Mathematics and Science	3
TSL 4324	ESOL Issues and Strategies for Content Teachers – <i>GL</i>	3

BS/BA Honors Major

The Honors Major in Geosciences/Earth Sciences provides outstanding students with the opportunity to do original research under a faculty sponsor. To graduate with Honors, the student must carry out a research project, write up the project as an Honors Thesis, and present the results of the research in a Departmental seminar.

Admission to the Major

To be admitted to the major a student must have:

- Arranged to be sponsored by a faculty advisor.
- Completed all lower division courses required for the degree program.

- Taken at least 14 hours of Geoscience/Earth Science courses with a GPA of at least 3.5; 6 hours must be at the 3000 level or above.
- An overall GPA of 3.5 or higher in 3000 and 4000 level classes.
- Exceptions to these criteria may be granted in special cases through appeal to the Earth and Environment Undergraduate Committee.

Application to the program is made by submission of the Honors in Geosciences/Earth Sciences Admission Form to the Earth and Environment Undergraduate Committee. This is usually done in the semester before the student intends to begin the Honors thesis research.

Graduation Requirements

- A minimum GPA of 3.5 in courses in 3000 and 4000 level classes.
- Completion of all the B.S. requirements in Geosciences or B.A. requirements in Earth Sciences, including GLY 4989L (Honors Research, 3 credits) and GLY 4970 (Honors Thesis, 3 credits).
- Completion of Honors research in collaboration with Honors supervisor and presentation of a draft of the Honors thesis to the Earth and Environment Undergraduate Committee.
- Deposition of a completed approved copy of the Honors thesis with the Earth and Environment office.

Minor in Geology

The Minor in Geology is a five course sequence intended for students who wish to develop a basic understanding of geology, General Chemistry, CHM 1045L is a prerequisite for GLY 3202.

Required courses (17 credits)

GLY 1010	Physical Geology	3
GLY 1010L	Physical Geology lab	1
or		
GLY 3039	Environmental Geology	3
GLY 3039L	Environmental Geology Lab	1
and		
GLY 1100	Historical Geology	3
GLY 1100L	Historical Geology Lab	1
or		
GLY 1101	The History of Life	3
GLY 1101L	The History of Life Lab	1
and		
GLY 3202	Earth Materials	3
GLY 3202L	Earth Materials Lab	1
and		

At least 5 credit hours of approved Earth Sciences/Geoscience courses (excluding GLY 3039) at the 3000 of 4000 level.

Minor in Meteorology

This minor is intended for science/math/engineering majors who wish to develop an understanding of meteorology. Students from other majors who have math/science background and literacy can also take this minor. Calculus I or Business Calculus, and Physics I are pre- or co-requisites for General Meteorology. The minor

consists of at least 16 credits of courses within the Department of Earth Sciences.

Required Courses: (16 credits)

MET 3003	General Meteorology	3
MET 3502	Synoptic Meteorology	3
MET 3502L	Synoptic Meteorology Lab	1
MET 4420	Physical Meteorology	3

or

MET 4102	Physical Climatology	3
----------	----------------------	---

Plus, any two of the following courses (6+ credits):

MET 3103	Planetary Climate Change	3
MET 4300	Severe Weather	3
MET 4301	Dynamic Meteorology I	3
MET 4302	Dynamic Meteorology II	3
MET 4400	Meteorological Instrumentation and Observations	3
MET 4410	Remote Sensing: Radar and Satellite Meteorology	3
MET 4532	Hurricanes	3
MET 4750	Techniques for Earth System Modeling	3
OCE 3014	Oceanography – GL	3

or

OCP 3002	Physical Oceanography	3
----------	-----------------------	---

Environmental Studies Programs

The Department offers a Bachelor of Sciences degree program in Environmental Studies with a choice of majors in Agricultural Sciences and another in Natural Resources Sciences. These majors have been designed to provide students with broad academic knowledge and experience to pursue careers in the environmental professions of in sustainable agriculture. The Bachelor of Arts degree in Sustainability and the Environment is an interdisciplinary degree covering the varied aspects of environmental sustainability. Since sustainability encompasses many areas of academic interest, students are encouraged to also pursue appropriate minors and certificates that will complement the B.A. degree. The Department also offers a Minor in Environmental Studies. A grade of "C" or better is required for all required courses in the major and minor as well as for the Undergraduate Certificate in Environmental Studies.

Bachelor of Science in Environmental Studies

Degree Program Hours: 120

Students admitted to the university are admitted directly to their chosen major. Students are expected to make good progress based on critical indicators, such as GPA in specific courses or credits earned. In cases where students are not making good progress, a change of major may be required. Advisors work to redirect students to more appropriate majors when critical indicators are not met.

Lower Division Preparation

Common Prerequisite

For a list of all state-approved common prerequisites, including alternatives, visit <https://cpm.flvc.org>.

BSC 2010	General Biology I	3
----------	-------------------	---

BSC 2010L	General Biology I Lab	1
BSC 2011	General Biology II	3
BSC 2011L	General Biology II Lab	1
CHM 1045	General Chemistry I	3
CHM 1045L	General Chemistry I Lab	1
CHM 1046	General Chemistry II	3
CHM 1046L	General Chemistry II Lab	1

One of the following lecture and lab sequences:

ESC 1000	Introduction to Earth Sciences	3
ESC 1000L	Introduction to Earth Sciences Lab	1

or

GLY 1010	Physical Geology	3
GLY 1010L	Physical Geology Lab	1

or

GLY 3039	Environmental Geology	3
GLY 3039L	Environmental Geology Lab	1

One of the following courses:

EVR 3010	Energy Flow in Natural and Man-made Systems	3
----------	---	---

or

PHY 2023	Survey of General Physics	3
PHY 2048	Physics with Calculus I	4
PHY 2053	Physics without Calculus I	4

MAC 1114*	Trigonometry	3
-----------	--------------	---

or

MAC 1147*	Pre-Calculus Algebra and Trigonometry	4
ECO 2023	Microeconomics	3

*MAC 1105 or an appropriate score on the ALEKS placement exam is a prerequisite for MAC 1114 or MAC 1147

Additional Required Lower Division Courses

ISC 1056	First Year Seminar in Earth and Environment	1
----------	---	---

One of the following three courses:

STA 2023	Statistics for Business and Economics	3
STA 2122	Statistics for Behavioral and Social Sciences I	3

STA 3111	Statistics I	3
----------	--------------	---

One of the following three courses:

STA 3111	Statistics II	3
STA 3123	Statistics for Behavioral and Social Sciences II	3

MAC 2311	Calculus I	4
----------	------------	---

Upper Division Program

Required Courses for Both Majors (11 credits)

EVR 3011	Environmental Resources and Pollution	3
----------	---------------------------------------	---

EVR 4211	Water Resources	3
----------	-----------------	---

EVR 4211L	Water Resources Lab	1
-----------	---------------------	---

EVR 3723	Natural Resources Valuation and Economics*	3
----------	--	---

or

AEB 4131	Farm Economics and Management **	3
----------	----------------------------------	---

or

ECP 3302	Introduction to Environmental Economics	3
----------	---	---

ISC 4935	Senior Seminar in Earth and Environmental Science	1
----------	---	---

*EVR 3723 is strongly recommended for the Natural Resource Science Major.

**AEB 4131 is strongly recommended for the Agricultural Sciences major.

Required Courses for Agricultural Sciences Major (26 credits)

AGR 4240	Modern Crop Production	3
HOS 3012	Introduction to Horticulture	3
HOS 3012L	Introduction to Horticulture Lab	1
IPM 4020	Integrated Pest Management	3
EVR 4592	Soils and Ecosystems	3
EVR 4592L	Soils and Ecosystems Lab	1
SWS 4303	Soil Microbiology	3
SWS 4303L	Soil Microbiology Lab	1
AGG 4941	Internship in Agriculture	2
EVR 4272	Agroecology– GL	3
EVR 4274	Sustainable Agriculture – GL	3

Required Courses for Natural Resources Sciences Major (22 credits minimum)

EVR 4594	Analysis of South Florida Ecosystems	3
EVR 4323	Restoration Ecology and	3
EVR 4323L	Restoration Ecology Lab and	1
EVR 4352	U.S. Environmental Policy	3
POS 4035	Environmental Politics	3
<i>Two of the following courses:</i>		
EVR 4026	Ecology of Biotic Resources	3
EVR 4401	Conservation Biology	3
EVR 4592	Soils and Ecosystems	3
EVR 4910	Applied Ecology Field Excursion	3
GEO 3510	Earth Resources	3
GIS 3043C	Introduction to Geographical Information Systems	4

Additional Upper Division Environmental Courses (6 credits)

Students may choose any two environmentally related courses offered by the Department of Earth and Environment. Other courses from outside the Department may be used if approved by the Program Director.

Bachelor of Arts in Sustainability and the Environment

Degree Program Hours: 120

Common Prerequisite Courses

For a list of all state-approved common prerequisites, including alternatives, visit <https://cpm.flvc.org>.

Lower Division Requirements (14 credits)

IDS 1273	First Year Seminar in Sustainability	1
ECO 2023	Principles of Microeconomics	3
EVR 1001	Introduction to Environmental Science – GL	3
EVR 1001L	Introduction to Environmental Science Lab	1
MAC 1105	College Algebra	3
<i>And a choice of one of the following:</i>		
STA 2023	Statistics for Business and Economics	3
STA 2122	Statistics for Behavioral and Social	

Sciences I	3	
STA 3111	Statistics I	3

I. Upper Division Core Courses (13 credits)

EVR 3326	Sustainability: Principles and Practice	4
EVR 3740	Critical Thinking in Sustainability	3

And a choice of one of the following policy courses:

EVR 4352	U.S. Environmental Policy	3
POS 4035	Environmental Politics	3
EVR 4356	Coastal & Marine Environmental Policy	3
EVR 4112	Climate Change Policy	3

And a choice of one of the following economics courses:

EVR 3723	Natural Resource Valuations and Economics	3
AEB 4131	Farm Economics and Management	3

II. Upper Division Area Studies (21-22 credits)

- Select one course from each of the lists of required courses offered in all 3 areas – Sustainable Communities, Sustainable Ecosystems and Sustainable Resource Systems.
- Select 12 credits of courses from elective courses in one of the 3 areas of your choice. Credits are encouraged to be taken in the same area to form a concentration. Alternatively, courses from different areas may be combined.
- Courses not selected as a required core course can be used to satisfy the 12 credits of electives in the appropriate area. A course cannot be used to satisfy more than one requirement.
- Additional courses may be accepted as electives with permission of the Undergraduate Program Director.

A. Sustainable Communities

Choose one of the following required courses:

EVR 4411	Human Organization & Ecosystems Management	3
EVR 4415	Population & Environment Issues	3
EVR 4112	Climate Change Policy	3
EVR 4434	Sustainable Cities	3

Choose up to 12 credits from the following electives:

GIS 3043	Introduction to Geographical Information Systems	4
GLY 3034	Natural Disasters	3
GLY 4881	Coastal Hazards – GL	3
GLY 4734	Changing Coastlines – GL	3
MET 3103	Planetary Climate Change	3
EVR 4434	Sustainable Cities	3
EVR 4411	Human Organization & Ecosystems Management	3
EVR 4415	Population & Environment Issues	3
EVR 4112	Climate Change Policy	3
EVR 4356	Coastal & Marine Environmental Policy	3
EVR 4440	Beaches and Tourism	3
REL 3492	Earth Ethics – GL	3
EVR 3003	Latin America Environmental Issues	3

B. Sustainable Ecosystems

Choose one of the following required courses:

EVR 3011	Environ Resources & Pollution	3
EVR 3013/L	Ecology of South Florida & Lab	4
EVR 4594	Analysis of South Florida Ecosystems	3

OCE 3014	Oceanography - GL	3
<i>Choose up to 12 credits from the following electives:</i>		
EVR 3011	Environ Resources & Pollution	3
EVR 3013/L	Ecology of South Florida & Lab	4
EVR 4594	Analysis of South Florida Ecosystems	3
GLY 3039/L	Environmental Geology & Lab	4
OCE 3014	Oceanography - GL	3
MET 3103	Planetary Climate Change	3
GIS 3043	Introduction to Geographical Information Systems	4
GLY 4881	Coastal Hazards – GL	3
EVR 4323/L	Restoration Ecology & Lab	4
EVR 4910	Applied Ecology Field Excursion	3
EVR 4026	Ecology of Biotic Resources	3

C. Sustainable Resource Systems

Choose one of the following required courses:

EVR 3010	Energy Flow in Natural and Man-made Systems	3
EVR 4272	Agroecology – GL	3
EVR 4274	Sustainable Agriculture – GL	3
GEO 3510	Earth Resources – GL	3
AEB 4131	Farm Economics and Management	3
EVR 4274	Sustainable Agriculture – GL	3
HOS 3012/L	Horticulture & Lab	4
GEO 4354	Geography of the Global Food System – GL	3
AEB 4131	Farm Economics and Management	3
EVR 3163	Sustainable Forests	3
GIS 3043	Introduction to Geographical Information Systems	4

III. Capstone Sequence (6 credits)

EVR 4321	Sustainable Resource Development	3
IDS 4232	Sustainability in Action	3

Choose up to 12 credits from the following electives

EVR 3010	Energy Flow in Natural and Man-made Systems	3
EVR 4310	Energy Resources	3
GEO 3510	Earth Resources – GL	3
EVR 4272	Agroecology – GL	3

Combined BS/MS or BA/MS in Environmental Studies Degree Pathway

The combined BS/MS or BA/MS degree pathway in Environmental Studies allows qualified students to earn both the BS in Environmental Studies or the BA in Sustainability and the Environment and a non-thesis MS in Environmental Studies, in a shorter amount of time than typically required for earning degrees sequentially. The accelerated pathway is designed for highly qualified undergraduate students in the Department of Earth and Environment.

To be considered for admission to the combined bachelor's/master's degree pathway, students must have completed at least 75 credit hours including all lower division requirements, typically have at least 30 credit hours remaining in the program, and meet the admissions criteria for the graduate degree program to which they are applying. Students need only apply once to the combined degree pathway; the application is submitted to Graduate Admissions typically before the student starts the last 30 credits of the bachelor's degree program. A student

admitted to the combined degree pathway will be considered to have undergraduate status until the student applies for graduation from their bachelor's degree program. 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

1. Current enrollment in the Bachelor's Degree Program in Environmental Studies or Sustainability and the Environment at FIU.
2. Completed at least 75 credits of coursework (including UCC), and typically has at least 30 credits remaining.
3. Completion of all lower division required courses for the Bachelor's degree.
4. Current GPA of 3.25 or higher.
5. Official GRE scores.
6. Three letters of recommendation.
7. Approval by the Earth and Environment Graduate Committee.

General Requirements

1. Meet the requirements of both the BS in Environmental Studies or BA in Sustainability and the Environment and the non-thesis MS degree in Environmental Studies.
2. Overlap of programs: Up to 3 courses (9 credits) may be used in satisfying **both** the BA/BS and MS degree requirements, which must be at the 5000-level or higher.

Minor in Environmental Studies

The Minor in Environmental Studies consists of a set of five courses that provide students with an introduction to the area of natural resources.

Required Courses

1. Four of the following courses:

EVR 3011	Environmental Resources and Pollution	3
EVR 4026	Ecology of Biotic Resources	3
EVR 4211	Water Resources	3
EVR 4310	Energy Resources	3
EVR 4323	Restoration Ecology	3
EVR 4401	Conservation Biology	3
EVR 4592	Soils and Ecosystems	3
2. One of the following courses:

EVR 4415	Population and Environment Issues	3
EVR 4321	Sustainable Resource Development	3
EVR 4352	US Environmental Policy	3

Total Credits **15**

Grades of 'C' or better required for all courses. Other Environmental Studies courses offered by the Department of Earth and Environment may be substituted subject to approval of the Undergraduate Program Director.

Course Descriptions

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

Definition of Prefixes

AEB-Agricultural Economics and Business; AGG-Agriculture: General; AGR-Agronomy; ESC-Earth Sciences; EVR-Environmental Studies; EVS-Environmental Science; GEO-Geography: Systematic; GIS-Geography: Information Science; GLY-Geology; HOS-Horticultural Sciences; IDS-Interdisciplinary Studies; IPM-Integrated Pest Management; ISC-Interdisciplinary Science/Natural Science; MET-Meteorology; OCE-Oceanography; OCP-Physical Oceanography; SWS-Soil and Water Sciences

F-Fall semester offering; S-Spring semester offering; SS-Summer semester offering.

Courses that meet the University's Global Learning requirement are identified as GL.

AEB 4131 Farm Economics and Management (3). The application of economic principles to farm management, budgeting techniques, farm financial and risk analysis, and marketing plan. Covers farm management strategies for sustainable farming. Prerequisites: ECO 2023 or equivalent.

AGG 4055 Food Security and Food Safety (3). This course provides an understanding of food security and food safety principles and practices, emphasizes the integrated approaches to achieving both local and global food security and food safety. Prerequisite: BSC 2010 or EVR 1001

AGG 4941 Internship in Agriculture (0-15). Practical experience by working or conducting research at a farm, field, or private or government agency on topics related to food and agriculture with approval of faculty supervisor. May be repeated. (Pass/Fail only). Prerequisites: Permission of the instructor.

AGR 3930 Agriculture Colloquium (1). Promotes general knowledge of agriculture from soil science to agriculture marketing and business. May be repeated with change of content.

AGR 4240 Modern Crop Production (3). Basic of various agronomic crops, how they related to environment, what are the principles of production, management of problems, and the utilization of crops. Prerequisites: BSC 2010, BSC 2011 or permission of the instructor.

AGR 4641 Sustainable Bioenergy (3). Principles and technological approaches of converting biomass from plants, algae, and microorganism to biofuels. Understand factors influencing public acceptance of biofuels. Prerequisites: EVR 1001, BSC 2010, CHM 1045.

AGR 5241 Advance Modern Crop Production (3). An advance course in agronomy applying crop, soil, and environmental sciences in understanding agricultural systems in the world. Includes the concepts of plant, seed, water, soil, tillage, pest, post-harvest, ecophysiology, and sustainable aspects of crop production.

ESC 1000 Introduction to Earth Sciences (3). **ESC 1000L Introduction to Earth Sciences Lab (1).** Survey of Earth science including earth materials, surface and internal processes, earth history, oceanography and atmospheric science. Students cannot get credit for both this course and GLY 1010 and GLY 1010L. (F,S,SS)

ESC 3050 Seminar in Earth Science Education (1). Seminar covering theoretical and practical issues encountered in the teaching of Earth Sciences. Students will discuss experience gained as learning assistants. Prerequisites: GLY 1010 and GLY 1010L, GLY 1101 and GLY 1101L and permission of the instructor.

ESC 3930 Topics in Earth Sciences (1-5). Selected topics in the earth sciences.

ESC 4052 Inquiry-Based Learning in the Earth Sciences (3). Important concepts in the Earth Sciences covered using inquiry based learning techniques. Content delivery using laboratory exercises and technology. Prerequisite: Permission of the instructor.

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

EVR 1001 Introduction to Environmental Science – GL (3). This course emphasizes scientific knowledge in global context about the environment including nutrient cycling, pollution, desertification, climate change, energy, water resources, biodiversity loss. (F,S, SS)

EVR 1001L Introduction to Environmental Science Lab (1). Laboratory analysis and field trips on topics and concepts covered in Introduction to Environmental Sciences. (F,S,SS)

EVR 1017 Climate Change, the Global Environment, and Society– GL (3). A broad introduction to impacts of climate change on social/economic processes and global environment with historical perspectives. (F, S, SS)

EVR 2904 CAChE Discovery 1: Research in Aquatic Ecosystems (1). This is an undergraduate course to explore topics in ecotoxicology and aquatic chemistry and providing students research experience. Part of the NSFCREST-CAChE Program.

EVR 3003 Latin American Environmental Issues (3). An overview of historical and emerging environmental issues in Latin American countries. Themes covered include environmental history, urban pollution, tropical deforestation, and indigenous peoples.

EVR 3010 Energy Flow in Natural and Man-made Systems (3). A course examining energy use and efficiency, nuclear and renewable energy sources, and their environmental impacts. Prerequisites: MAC 1105 or equivalent. (F,S,SS)

EVR 3011 Environmental Resources and Pollution (3). An environmental science course for science majors focusing on human impacts on the environment, especially water and nutrient cycling, resource use and pollution. Prerequisites: MAC 1105 or equivalent, and an introductory science course. (F,S,SS)

EVR 3011L Environmental Science: Pollution Lab (1). Laboratory and field analysis of topics and concepts covered in EVR 3011. Corequisite: EVR 3011.

EVR 3013 Ecology of South Florida (3). **EVR 3013L Ecology of South Florida Lab (1).** A course for non-science majors, offering an introduction to the ecology of South Florida through lectures and a series of field trips

into several unique ecosystems, such as the Everglades, hardwood hammocks, and coastal regions. The course also deals with natural resource conservation, wildlife management, endangered species, and wilderness issues. (F,S,SS) Lab Prerequisite or Corequisite: EVR 3013

EVR 3029 The Everglades (3). An interdisciplinary examination of the Everglades system, including natural history, human history, esthetics, and politics/policy of restoration.

EVR 3163 Sustainable Forests (3). Study of the ecology and management of the world's forests, their governance and economics, and the critical role they play in the sustainable development of local communities and global ecosystems.

EVR 3326 Sustainability Principles and Practice (4). Introduction to the principles and practices of sustainability and challenges for human society to provide a foundation for sustainability studies, including applications as practicums.

EVR 3402 Asian Environmental Issues (3). An overview of emerging environmental issues in Asian countries. Discussion of cultural, economic, and political systems of the region and their influence on the environment.

EVR 3723 Natural Resource Valuation and Economics (3). The market and non-market valuation of natural resources and how their values are used for different resource allocation decisions. Also covers economic bases of natural resource policies. Prerequisites: ECO 2023 or equivalent. (F,S,SS)

EVR 3740 Critical Thinking in Sustainability (3). Facilitate critical thinking about sustainability principles through interpretation, discussion and critical review of sustainability research and practice.

EVR 3925 CACHe Discovery 2: Professional Pathways in Aquatic and Environmental Science (1). This is an undergraduate course to assist students in developing abilities to become better science communicators and professionals. Part of the NSFCREST-CACHe Program.

EVR 3931 Topics in Environmental Studies (3). An intensive analysis of a current environmental topic. Course may be repeated with change in content.

EVR 3949/EVR 4949 Cooperative Education in Environmental Studies (1-3). One semester of full-time supervised work in an outside laboratory taking part in the University Co-op Program. Limited to students admitted to the Co-op Program. A written report and supervisor evaluations will be required of each student.

EVR 4023 Coastal Resource Management (3). An introduction to the basic concepts, principles, and analytical tools used in the management of coastal resources.

EVR 4026 Ecology of Biotic Resources (3). The study of renewable natural resources of the earth's biomes, particularly those of tropical forests, the factors influencing their productivity, conservation, and human use. Prerequisites: BSC 2010 and BSC 2011. (F)

EVR 4112 Climate Change Policy (3). Introduction to policies governing climate change mitigation. Examines the impetus for, specific mechanisms used to implement, and effectiveness of both national and international policies. Prerequisites: EVR 4352 or permission of the instructor. (S)

EVR 4120 Natural Disasters and Society (3). Introduce basic concepts and analytical tools of societal responses in managing natural disasters.

EVR 4211 Water Resources (3). A seminar dealing with various aspects of water use, water pollution problems, chemistry and ecology of South Florida's waters. Ecology is recommended. Prerequisites: CHM 1045 and CHM 1046 or equivalent and general biology. (F)

EVR 4211L Water Resources Lab (1). Laboratory course on procedures currently suitable and widely accepted for physical, chemical, and biological methods in the examination of water. Prerequisite or Corequisite: EVR 4211. (F)

EVR 4231 Air Resources (3). Common air pollutants - their sources and methods of control. Different legislative and administrative approaches will be studied. Prerequisites: CHM 1045 and CHM 1046 or equivalent.

EVR 4272 Agroecology – GL (3). Application of ecological principles to farming systems to achieve goals of long term food production without depleting Earth's resources. (F).

EVR 4274 Sustainable Agriculture – GL (3). Analysis of sustainability of modern agricultural systems under a variety of ecological economic and cultural settings. Familiarizes students with socioeconomic, urban policy, sustainable agriculture. (S)

EVR 4310 Energy Resources (3). Seminar dealing with power and energy production in modern society, fundamental energy relationships of industrial and domestic processes. Prerequisites: EVR 3010 or PHY 2023 or equivalent.

EVR 4321 Sustainable Resource Development (3). An overview of social, economic and ecological approaches to sustainable resource development. Examines various policies for harmonizing economic growth and environmental sustainability. (F)

EVR 4323 Restoration Ecology (3). Principles and practices of environmental restoration, recreation and enhancement. Examines ecological theory that relates to restoration through case studies from southern Florida. Prerequisites: EVR 3013 or EVR 4594 or PCB 3043 or permission of the instructor. (S)

EVR 4323L Restoration Ecology Lab (1). This lab is to illustrate concepts and applications of ecological restoration theories through visitations to and participations in various ecological restoration sites in South Florida. Prerequisite or Corequisite: EVR 4323. (S)

EVR 4351 U.S. Energy Policy (3). Policies governing the utilization of energy in the U.S. Focuses on the physical, political and social constraints that shape energy policy in this country. Prerequisites: EVR 3010 or permission of the instructor.

EVR 4352 U.S. Environmental Policy (3). Introduction to U.S. environmental policy. Reviews primary U.S. environmental legislation and the role of regulation. (F,S,SS)

EVR 4356 Coastal and Marine Environmental Policy (3). Examine policies that govern the utilization and protection of coastal and marine areas. Focus on the political, social, environmental and economic constraints that shape the policy process. (S)

EVR 4374 Ecology and Management of Invasive Species (3). An overview of the key ecological, social, and management questions surrounding introduced invasive species.

EVR 4401 Conservation Biology (3). Applies modern theory from ecology and population genetics to conservation issues. Topics include population viability studies, reserve design, forms of rarity, and policy issues. Prerequisites: BSC 2010 and BSC 2011. (F)

EVR 4410 Global Perspectives on Water and Environment (3). This course explores the status, trends of use, management and conservation of global water resources. (S)

EVR 4411 Human Organizations and Ecosystem Management (3). Environmental aspects of organizational theory and strategic management in indigenous and other local communities, non-governmental organizations, governments, and the private sector are discussed. Prerequisite: An introductory Environmental Studies course. (F)

EVR 4415 Population and Environment Issues (3). A study of co-evolutionary relationships between humans and their environment and subsequent impacts on human populations across time. (S)

EVR 4434 Sustainable Cities (3). Introduction to the theories, concepts, and current trends relevant to the creation and maintenance of Sustainable Cities. Prerequisite: Junior standing.

EVR 4440 Beaches and Tourism (3). Discussion and analysis of the dual role of beaches as foremost global recreational areas and important coastal environmental resources. (F)

EVR 4592 Soils and Ecosystems (3). A review of basic soil science concepts; analyses of basic physical and chemical properties of soils, emphasizing soils in South Florida ecosystems. Prerequisites: BSC 2010 and CHM 1045, or permission of the instructor. (S)

EVR 4592L Soils and Ecosystems Lab (1). Laboratory exercises provide soil characterization techniques used in soil science and complement the lectures by carrying out experiments illustrating soil science concepts, soil formation, soil properties, and soil nutrients cycling. Corequisite: EVR 4592. (S)

EVR 4594 Analysis of South Florida Ecosystems (3). In-depth study, using case study approach of the major ecosystems of South Florida, the environmental issues facing them, and the management strategies employed to sustain their natural resources. Prerequisites: BSC1011, BSC1011L or permission of instructor. (S)

EVR 4596L Applied Field Ecology (2). Introduction to basic methodologies of applied field ecological research; builds ability to identify major plant and animal species and community assemblages in South Florida. Prerequisites: BSC 2011, BSC 2011L.

EVR 4869L Environmental Problem Solving Lab (2). Provides first-hand experience in solving environmental problems (problem definition, study design, data collection, analysis & reporting). Includes use of case study, social survey, computer modeling and GIS techniques. Prerequisites: STA 3111, ECO 2023, EVR 3010, and EVR 3011, or permission of the instructor.

EVR 4905 Research and Independent Study (VAR). Student develops and carries out research project with guidance from professor. Permission of the instructor.

EVR 4910 Applied Ecology Field Excursion (3). A hands-on learning experience in how ecosystems and their characteristic plant and animal species function. Involves a multi-day field excursion to a landscape of ecological and management interest. Prerequisite: BSC 2011 and BSC 2011L or permission of instruction. (S in alternate years)

EVR 4920 Environmental Studies Senior Seminar (1). Seminar includes discussions of environmental careers, preparation of research proposal or paper and attendance at talks given by experts in environmental topics. Prerequisite: Permission of instructor.

EVR 4924 Environmental Education (3). Principles and methods of teaching sustainable living, personal and institutional, emphasizing S. Florida, using reading, discussion, projects and visits to local EE programs.

EVR 4934 Special Topics (1-3). Advanced undergraduate level course dealing with selected environmental topics. Course may be repeated with change in content.

EVR 4941 Internship in Environmental Studies (0-6). Direct experience working in areas of environment or sustainability in government, industry, non-profit or research with approval of Faculty supervisor. May be repeated for credit. (Graded Pass/Fail) Prerequisites: Permission of the instructor.

EVR 5006 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. (F)

EVR 5061 South Florida Ecology: Field Studies (3). Introduction to ecology of South Florida. Series of field trips to unique ecosystems (Everglades, hard-wood 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.

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.

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 5122 Natural Disasters and Social Vulnerability (3). Natural Disasters and Social Vulnerability course will introduce basic concepts and analytical tools of societal responses in managing natural disasters.

EVR 5219 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 man-made 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.

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 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.

EVR 5360 Protected Area Management (3). Explores historical, ecological, legal and socioeconomic aspects of the management of natural areas using examples worldwide. Prerequisite: Graduate standing in Environmental Studies or permission of instructor

EVR 5375 Advanced Restoration Ecology (3). Restoration planning, endangered species reintroduction, disturbed land reclamation, ecosystem restoration, challenges of climate change on ecological restoration. Prerequisite: One course or more in ecology.

EVR 5376 Advanced Ecology and Management of Invasive Species (3). An in depth study of the key ecological, social, and management questions surrounding introduced invasive species.

EVR 5406 Endangered Species Policy and Management (3). Exploration of the history of the U.S. Endangered Species Act, and its implementation and effectiveness through the listing and recovery planning processes. Prerequisite: Graduate standing in Environmental Studies or Biology, or permission of instructor.

EVR 5409 Advanced Conservation Biology (3). Exploration of modern applications of ecology, genetics and evolutionary biology in the conservation biology. Policy aspects of biological conservation are also discussed. Prerequisites: BSC 2010 and BSC 2011.

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.

EVS 4164 Applied Environmental Geology (3). **EVS 4164L Applied Environmental Geology Lab (1).** A survey of the geological and geographical factors critical to man's attempt to contend with the natural processes. Construction problems, sewers, waste disposal, dams, ground water, and terrain evaluation in relation to the nature of the underlying substratum. Principles illustrated from South Florida and the Caribbean region in particular. Study of the geological factors involved in future development and growth of these areas, and conservation methods in relation to the geology of these areas. Prerequisites: GLY 1010, GEO 2200, and a sound background in mathematics, physics, and chemistry. Laboratory must be taken concurrently with the course.

GEO 2200 Physical Geography (3). **GEO 2200L Physical Geography Lab (1).** Survey of the physical environment relevant to studies in regional geography and earth sciences. Natural evolution of landforms, and the interacting processes responsible for these features. Environmental modification and deterioration caused by human interaction. Effects of these changes: socioeconomic impact and geographic problems. Case studies illustrated from South Florida and the Caribbean region.

GEO 3510 Earth Resources – GL (3). Geological occurrence, extraction and uses of mineral and energy resources, and associated global environmental, economic, social and political problems through time. (F,S,SS)

GEO 3510L Earth Resources Laboratory (1). Introduction to minerals and rocks used by society. Case studies of geologic, environmental and economic aspects of resource extraction and use. Corequisite: GEO 3510.

GIS 3043C Introduction to Geographical Information Systems (4). Introduction to GIS concepts and software such as ArcView. Topics include: cartographic basics, spatial datasets, attributes, map production, spatial statistics and analysis, and obtaining GIS data. (F,S,SS)

GIS 4119 Building Geodatabases and Geoprocessing Tools for Earth and Environmental Data (3). An advanced course in the import and design of geospatial data in ArcGIS including the use and creation of geoprocessing tools with the Model Builder and Python scripting. Metadata and documentation. Prerequisite: GIS 2040 or GIS 3043C or GIS 3048 or CGN 4321 or other introductory course in GIS (F in alternate years)

GIS 4303 Geospatial measurement techniques in Earth and Environmental Sciences (3). Students will be introduced to state-of-the-art field geospatial measurement techniques that will prepare them to conduct advanced research in their senior year and graduate school. (S in alternate years)

GIS 4390 Advanced Spatial Analysis of Earth and Environmental Data (3). An advanced course in the analysis and modeling of geospatial data. Topics include: point, line and raster pattern analysis, geostatistical surface estimation, map algebra, and suitability modeling. Prerequisites: GIS 2040 or CGN 3043 or GIS 3048 or CGN 4321 or other introductory course in GIS. (S in alternate years)

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 AroGIS. Prerequisite: Permission of the instructor. (F)

GLY 1010 Physical Geology (3). **GLY 1010L Physical Geology Lab (1).** Survey of Geology including Earth materials and structure, internal processes, surface processes, groundwater and climate change. Students cannot receive credit for both this course and ESC 1000 and ESC 1000L. (Lab fees assessed) (F,S,SS)

GLY 1037 Environmental Hydrology for High School Students (1). Environmental issues surrounding the natural occurrence and human use of surface water and groundwater in South Florida. Includes field trips to local sites of hydrologic/environmental significance.

GLY 1100 Historical Geology (3). **GLY 1100L Historical Geology Lab (1).** An introduction to the geological history of the earth and the geological time scale. Evolution of animals and plants. Prerequisites: GLY 1010 or GLY 3039 or equivalent. Lecture and lab must be taken concurrently.

GLY 1101 The History of Life (3). **GLY 1101L The History of Life Laboratory (1).** Interaction of biological and geological principles and processes, history and ecology of past life, and major events such as the marine invasion of land, mass extinctions, and the Ice Age. (F,S)

GLY 2072 Earth's Climate and Global Change (3). Introduction to Earth's climate and the variations of climate through geological and historical time. Emphasis is placed on the importance of the interactions of Earth's crust, atmosphere, biosphere and oceans in affecting the planet's climate.

GLY 2072L Earth's Climate and Global Change Lab (1). Practical analysis of the important factors affecting Earth's Climate. Analysis of historical and geological records of climate change. Corequisite: GLY 2072.

GLY 3034 Natural Disasters (3). A geological look at catastrophic events including earthquakes, volcanoes, tsunamis, mass movements, hurricanes, floods, and desertification. Emphasis on the geologic setting in which these natural disasters take place. Special attention will be given to compare similar disasters in the geologic past. Prerequisite: Physical science at the high school level. (F,S,SS)

GLY 3039 Environmental Geology (3). **GLY 3039L Environmental Geology Lab (1).** The composition and structure of the earth, the internal and external forces acting upon it and the resulting surface features. Case studies and general principles illustrated from South Florida and the Caribbean. Field trips expected. No prerequisites. (F,S)

GLY 3103 Dinosaurs (3). Survey of the different groups of dinosaurs. Dinosaur biology, geology, and the history of their discovery to further understanding of their life histories, environments, and the causes of their extinction.

GLY 3103L Dinosaurs Laboratory (1). Survey of the different groups of dinosaurs. Laboratory study of dinosaur bones, prints and eggs to further our understanding of their life histories, environments, and the causes of their extinction. Corequisite: GLY 3103.

GLY 3112 Earth through Time (3). Evolution of the Earth through its 4600 million year history, the fossil record and the geologic time scale. Major geologic events of the past and their effects on organic evolution. (S)

GLY 3153 Workshop in South Florida and Caribbean Geology (2). Workshop on the geology of South Florida and the Caribbean for science majors. Includes field trips in South Florida. Prerequisite: Permission of the instructor.

GLY 3157 Elements of Caribbean Geology (3). A survey of the geology of the Caribbean and neighboring regions in view of current data and modern concepts of global tectonics. The course summarizes the important points of Caribbean and Central American geology in their relation to mineral and energy resources; natural environmental disasters, especially seismic zones; agriculture; and the geologic potential for future development and industrialization.

GLY 3202 Earth Materials (3). Physical and chemical properties of minerals and mineral assemblages, such as rocks and soils. Processes of mineral formation. Prerequisites: ESC 1000 or GLY 1010 or GLY 3039 or permission of the instructor and CHM 1045. Corequisite: GLY 3202L. (F)

GLY 3202L Earth Materials Lab (1). Physical and chemical properties of minerals, rocks and soils with emphasis on identification. Application of macroscopic methods, X-ray diffraction, polarized light microscopy, in situ and bulk chemical analysis. Prerequisite or Corequisite: GLY 3202. (F)

GLY 3220 Optical Mineralogy (3). **GLY 3220L Optical Mineralogy Lab (1).** Principles and use of the petrographic microscope. Optical properties of isotropic, uniaxial and biaxial minerals. Prerequisites: GLY 3202 or equivalent. Laboratory must be taken concurrently with course.

GLY 3630 Research in Tropical Environments (3). Earth Sciences, Biology and Environmental Studies faculty describe research in marine and terrestrial ecosystems, geology, conservation and education. Students discuss scientific articles.

GLY 3751 Introduction to Mineral Science (2). Workshop introducing properties and uses of minerals, and techniques used to investigate minerals. Prerequisites: One of the following: BSC 2010, CHM 1045, PHY 2053, GLY 1010.

GLY 3754 Remote Sensing in the Earth Sciences (3). Remote sensing methods for the exploration and investigation of geologic processes and earth resources; airphoto interpretation, processing and analysis of multiband digital satellite imagery; GIS. Prerequisites: GLY 1010 or permission of the instructor. (F in alternate years)

GLY 3759 Visualizing Our World With GIS (3). Visualization of geospatial data in the Earth Sciences with Geographic Information Systems. Topics include natural hazards, distribution of water, mineral, and energy resources, and urban sprawl.

GLY 3760C Geological Map Analysis (3). Laboratory course dealing with analysis of geological maps and sections; theory and method of interpretation of surface outcrops on maps. Properties of simple geological structures. Recommended to be taken prior to GLY 4400 and GLY 4791. Prerequisites: Trigonometry, Introduction to Earth Science or equivalent (e.g. MAC 2132, GLY 3039 or equivalents).

GLY 3782 Geology Field Excursion (3). A one to three-week field excursion in a region of interest to demonstrate the occurrence, appearance and processes of various

geological phenomena. Course may be repeated. Prerequisites: ESC 1000 or GLY 1010 or GLY 3039 or permission of the instructor. (S)

GLY 3820 Applied Hydrogeology of South Florida (2). Workshop introducing hydrogeology of South Florida, and laboratory and field techniques used to study groundwater. Prerequisites: One of the following: BSC 2010, CHM 1045, PHY 2053, GLY 1010.

GLY 3881 Environmental Geology Field Methods (3). Introduction to commonly used field methods in environmental geology including site evaluation, bore-hole geophysical and hydrogeological techniques, and topographic map skills. Prerequisites: ESC 1000 or EVR 1001 or GLY 1010 or GLY 3039.

GLY 3882 Environmental Geology Florida Keys Workshop (2). Workshop introducing environmental geology of the Florida Keys, Bay-Island-Reef transect. Prerequisites: One of the following: BSC 2010, CHM 1045, PHY 2053, GLY 1010, or equivalent.

GLY 3949/GLY 4949 Cooperative Education in Geology (1-3). One semester of full-time supervised work in an outside laboratory taking part in the University Co-op Program. Limited to students admitted to the Co-op Program. A written report and supervisor evaluations will be required for each student.

GLY 4036 Earth Sciences and Society (3). Explores the new directions of Earth Science studies and examines how they can enhance society's ability to make wise decisions on resource development, waste disposal, natural hazards. Prerequisites: GLY 1010 or GLY 3039.

GLY 4281C Introduction to SEM with EDS Analysis (3). Introduction to imaging and microanalysis of materials using SEM including EDS and XRF. Prerequisite: Permission of instructor

GLY 4300 Petrology (3). Origin, composition and classification of igneous, sedimentary, and metamorphic rocks. Observational, theoretical, and experimental studies of rocks. Prerequisite: GLY 3202. (S)

GLY 4300L Petrology Lab (1). Identification of rocks using macroscopic and microscopic techniques. Application of electron microprobe. Prerequisite or Corequisite: GLY 4300. (S)

GLY 4400 Structural Geology (3). **GLY 4400L Structural Geology Lab (1).** Faults, folds, fractures and other rock structures; their description and representation on maps and diagrams; mechanics of their formation. Prerequisites: ESC 1000 or GLY 1010 or GLY 3039 and MAC 1114 or MAC 1147. (F)

GLY 4450 Environmental and Exploration Geophysics (3). Introduction to geophysical methods used in exploration and environmental geophysics. Seismic methods; potential fields; electrical and EM methods; ground penetrating radar; geophysical well logging. Prerequisites: MAC 2312; PHY 2049 or 2054; or permission of the instructor. (S in alternate years)

GLY 4511 Stratigraphy (3). Stratigraphic principles applied to interpreting the rock record. Sediments, depositional environments and dynamics in the sedimentary record. Stratigraphic correlation and the

development of the Geologic Time Scale. Prerequisite: GLY 3202. (F)

GLY 4511L Stratigraphy Lab (1). Laboratory analysis of rock facies and index fossils used in the interpretation of the geologic record. Prerequisite or Corequisite: GLY 4511. (F)

GLY 4551 Sedimentology (3). **GLY 4551L Sedimentology Lab (1).** Sedimentary processes in the geological cycles, as illustrated in recent environments. Different groups of sedimentary rocks. Primary and secondary sedimentary structures. Physicochemical properties and diagenetic processes. Analytical techniques applied to modern sedimentology of both loose and lithified sediments. Prerequisites: Introduction to Earth Science or equivalent; Earth Materials and Stratigraphy and a sound background in mathematics and chemistry. Laboratory must be taken concurrently with course.

GLY 4603 Paleobiology (3). Development of life as traced through the fossil record. Survey of the main groups of animals commonly found as fossils. Theories of evolution and extinction. Study of the major fossil groups used in biostratigraphic zonation, and as paleoecologic indicators. Prerequisites: GLY 1010, or GLY 3039, or BSC 2010, or permission of the instructor.

GLY 4603L Paleobiology Lab (1). Development of life as traced through the fossil record. Survey of the main groups of animals commonly found as fossils. Theories of evolution and extinction. Study of the major fossil groups used in biostratigraphic zonation, and as paleoecologic indicators. Prerequisites: GLY 1010, BSC 2010, or permission of the instructor.

GLY 4660 Paleoecology (3). Fossils, sedimentary rocks, taphonomy, and stable isotopes of oxygen and carbon are applied to interpreting local environmental changes and regional to global climate changes of the past. (F)

GLY 4730 Marine Geology (3). Origin of ocean floor physiographic provinces and modern theories concerning the evolution of Earth's ocean basins. Characteristics and distribution of marine sediments and their interpretation. Prerequisites: ESC 1000 or GLY 1010 or GLY 3039 or OCE 3014 or OCP 3002 or permission of the instructor.

GLY 4734 Changing Coastlines – GL (3). Focus on the physical processes that cause erosion and shape our coastlines and the consequences for human development and habitation of this dynamic landscape. (S)

GLY 4791 Field Geology and Geologic Mapping (3-6). A three-to six-week field instruction and practice in methods of constructing stratigraphic sections, structural cross sections and geologic mapping using topographic base maps, aerial photos, and surveying equipment. Prerequisites: GLY 4511 and GLY 4511L, GLY 4400 and GLY 4400L. (SS)

GLY 4812 Introduction to Ore Deposits (3). Major classes of metal deposits, their geologic settings and genetic theories, and case studies of great deposits. Environmental, economic and legal aspects of metal extraction, processing and use. Prerequisites: GLY 1010, GLY 1010L or GLY 3039, GLY 3039L.

GLY 4822 Introduction to Hydrogeology (3). Principles of groundwater flow, determination of aquifer properties, geologic factors influencing groundwater flow and quality, legal/regulatory framework for hydrogeology. Prerequisites: PHY 2048 or PHY 2053, CHM 1045, MAC 2311, or permission of the instructor. (S)

GLY 4822L Introduction to Hydrogeology Lab (1). Principles of groundwater flow, determination of aquifer properties, geologic factors influencing groundwater flow and quality. Prerequisites: CHM 1045, GLY 1010, PHY 2053, MAC 2311, or equivalent. Corequisite: GLY 4822.

GLY 4823 Florida Geologic and Hydrologic Systems (3). Survey of geological formations of Florida and their relationship to hydrologic and mineral resources. Sedimentary facies in relation to their hydrologic properties. Prerequisites: GLY 4822 and GLY 4511 or permission of the instructor.

GLY 4881 Coastal Hazards – GL (3). Focus on the processes responsible for tsunamis, storm surges, coastal erosion, land subsidence, sea level rise, etc. and their mitigation. (F)

GLY 4910, GLY 4911 Undergraduate Research in Geology (VAR). Individual research under the supervision of a professor in the student's field of specialization or interest. Subject may deal with laboratory work, field, and/or bibliographical work. Field research in the Caribbean is encouraged. Variable credit to a maximum of 10 credits. Permission of the student's advisor is required.

GLY 4937 Senior Seminar in Geological Sciences (1). Geosciences topics are researched, presented and discussed by students. Students develop knowledge of current research trends and written and verbal science communication skills. Prerequisites: Permission of instructor.

GLY 4947 Internship in Geoscience (0-6). Practical geological, geophysical, or hydrological work experience at local companies, non-profits, or government agencies supervised by a faculty member. May be repeated for credit. (Pass/Fail Only) Prerequisite: Permission of Instructor.

GLY 4970 Geology Honors Thesis (3). Preparation of honors thesis and research seminar. Prerequisite: GLY 4989L.

GLY 4989L Geology Honors Research (1-3). Laboratory and/or field study in consultation with a faculty advisor. Prerequisite: Admission into Geology honors major.

GLY 5021 Earth Sciences for Teachers (3). Study of geological materials and processes, as covered in Introduction to Earth Science, but at a higher level and with additional assignments. Prerequisite: Permission of the instructor.

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.

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

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: Introduction to Earth Science and General Chemistry.

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.

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.

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.

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.

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.

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.

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.

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.

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 2313, or permission of the instructor. Corequisite: GLY 5408L.

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

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.

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.

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.

GLY 5475 Exploration Geophysics (3). New in depth review of geophysical methods used in exploration and environmental geophysics. Digital data processing; Seismic methods; potential fields; electrical and EM methods; ground penetrating radar. Prerequisites: MAC 2312, PHY 2049 or PHY 2054.

GLY 5495 Seminar in Geophysics (2). Detailed investigation of current geophysical techniques, including topics on instrument design. Prerequisites: GLY 5457 or permission of the instructor.

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.

GLY 5518 Advanced Stratigraphy (3). Principles of stratigraphy and the geologic time scale applied to the sedimentary rock record, to determine dynamics of sedimentation, depositional environments and correlation. Prerequisite: Permission of the instructor. Corequisite: GLY 5518L.

GLY 5518L Advanced Stratigraphy Laboratory (1). Training in laboratory techniques to analyze sedimentary rocks for depositional reconstruction and correlation. Prerequisite: Permission of the instructor. Corequisite: GLY 5518.

GLY 5593 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 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.

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 4603 or permission of the instructor.

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 4603 or permission of the instructor.

GLY 5627 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.

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 hydrochemical models.

GLY 5736 Marine Geology and Geochemistry (3). Examination of ocean floor provinces and the evolution of Earth's ocean basins. Interpretation of the distribution and geophysical and geochemical characteristics of seafloor basalt and sediments. Prerequisite: Permission of the instructor.

GLY 5737 Coastal Processes and Environments (3). Focus on the physical processes that cause erosion and shape our coastlines and the consequences for human development and habitation of this dynamic landscape. Prerequisite: Permission of the instructor.

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 (1-6). 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.

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.

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.

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.

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.

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

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.

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 5875 Applications of Transmission Electron Microscopy (3). An introduction to theory and practical use of the JEOL JEM-1200EX II, Transmission Electron Microscope. Students will learn to prepare specimens and use for digital recording of publishable images. Prerequisites: Graduate standing or permission of the instructor.

GLY 5888 Coastal Hazards and Mitigation (3). Focus on the processes responsible for tsunamis, storm surges, coastal erosion, land subsidence, sea level rise, etc. and their mitigation.

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.

HOS 3012 Introduction to Horticulture Science (3). Focus on theoretical knowledge on horticulture plant identification, propagation, controlled environment production, pruning, plants for interior uses, and fruits and vegetables. (F)

HOS 3012L Horticulture Science Lab (1). Focus on practical knowledge on horticulture plant identification, propagation, controlled environment production, pruning, plants for interior uses, and fruits and vegetables. Corequisite: HOS 3012. (F)

IDS 1231 Local and Regional Sustainability (3). Introduction to the concept of sustainability and the sustainable development of communities in the global, regional and local contexts.

IDS 1273 First Year Seminar in Sustainability (1). Seminar course meant for freshmen or 1st year transfer students in the undergraduate Sustainability and

Environment program. Topics include: designing plan of study, career development, getting help. (F,S)

IDS 3189 International Nutrition, Public Health and Economic Development (3). This course will examine the impact of global public health, nutrition and economic development on the physical and political environment. Recommended also for non-majors.

IDS 4232 Sustainability in Action (3). Application of sustainability concepts and principles to environmental problems solving in community, business of research settings, emphasizing project management and communication skills. Prerequisites: EVR 3326 or permission of instructor (F,S)

IPM 4020 Integrated Pest Management (3). An overview of Integrated Pest Management (IPM), emphasizes the integration of ecological, cultural, and chemical methods to manage pests to promote sustainable agroecosystems. Prerequisites: BSC 2010. (F)

ISC 1056 First Year Seminar in Earth and Environment (1). Weekly seminar course meant for freshmen or 1st year transfer students in the undergraduate Earth and Environment programs. Topics include: assessing your skills, planning your program, and getting help. (F,S)

ISC 4935 Senior Seminar in Earth and Environmental Science (1). Capstone course for graduating seniors in Earth and Environmental science. Includes discussion career pathways and completion of a research project with written and oral presentations. Prerequisite: Senior standing and permission of department. (F,S)

ISC 4940 Undergraduate Research Internship in Earth and Environment (0-6). Directed research internship under the supervision of a professor in the student's field of interest. Subject may deal with laboratory work, field work, and/or bibliographical work. Prerequisite: Permission of instructor.

ISC 5150 Introduction to Research in Earth and Environmental Sciences (2). Introduction to research in Earth and Environmental Sciences: nature of scientific inquiry, development of research projects, data analysis, publication and presentation of research results. (F)

ISC 5151 Earth and Environmental Graduate Seminar (1). Weekly seminar emphasizing research- and practice-oriented guest speaker series. Critical examination of current research topics by students, faculty, visiting speakers. Brief student reports. Prerequisite: Permission of the instructor. (F,S)

MET 3003 General Meteorology (3). A quantitative introduction to the Earth's atmosphere. Topics include tropical and mid-latitude weather, clouds and convection, solar and infrared radiation, general circulation and climate, and an overview of meteorological dynamics. Prerequisites: PHY 2048 or PHY 2053 or permission of the instructor. (F)

MET 3103 Planetary Climate Change (3). Interdisciplinary examination of causes, history, effects and strategies for mitigation of the Earth's changing climate. Prerequisite: Upper-division standing. (S)

MET 3502 Synoptic Meteorology (3). Atmospheric fluid dynamics applied to mid-latitude weather systems. Four dimensional analysis of weather systems and forecasts. Prerequisite: MET 3003. (S)

MET 3502L Synoptic Meteorology Laboratory (1). Development of diagnostic techniques for understanding of weather systems, using modern technological tools (e.g., we-based data, Doppler radar, satellite and real-time mesoscale models) to do weather forecasting. Prerequisite and Corequisite: MET 3502. (S)

MET 4102 Physical Climatology (3). Climate and its global distribution, the climate controls and processes, the influences of climate on the environment. Prerequisites: PHY 2054 or PHY 2049. (F)

MET 4300 Severe Weather (3). Local wind systems, thunderstorms, squall lines, mesoscale convection systems, hurricanes, and their interactions with synoptic scale systems. Prerequisites: MET 3003. (F in alternate years)

MET 4301 Dynamic Meteorology I (3). Air motion in rotating coordinates, pressure forces, hydrostatic balance, energy balance, and momentum and mass conservation, circulation and vorticity. Prerequisite: PHY 2048. (F)

MET 4302 Dynamic Meteorology II (3). Physical mechanisms that control synoptic-scale air motion in mid-latitude, Rossby waves, mesoscale circulations, and general circulations. Prerequisites: PHY 2048, PHY 2049, MET 4301. (S)

MET 4304 Introduction to Boundary Layer Meteorology (3). Understanding the basic dynamic and thermodynamic processes in the atmospheric boundary layer (ABL), the lowest part of the atmosphere that has direct impacts on our daily life. Prerequisites: PHY 2048 and PHY 2049.

MET 4400 Meteorological Instrumentation and Observations (3). Calibration and operation of basic meteorological sensors used to measure temperature, atmospheric flow, pressure, and moisture, including satellite and radar. Prerequisites: PHY 2048, MET 3003. (S in alternate years)

MET 4410 Remote Sensing: Radar and Satellite Meteorology (3). An overview of satellite and radar remote sensing including the principles of atmospheric radiative transfer, the retrieval of atmospheric variables, and basic principles of interpretation. Prerequisites: PHY 2048 and PHY 2049. (F in alternate years)

MET 4420 Physical Meteorology (3). Solar and infrared radiation, first and second thermodynamic law, entropy, phase change, physics of moist air and aerosols, condensation, clouds and precipitation formation processes. Prerequisites: PHY 2048, PHY 2049, MET 3003. (S)

MET 4520L Practical Forecasting (1). Focus on analysis and forecasting of middle-latitude and tropical weather systems, including tropical cyclones. Students will be required to give weather forecast discussions. Prerequisites or Corequisites: MET 3502 or permission of the instructor.

MET 4521 Advanced Forecasting (2). Students gain expertise in forecasting to guide setting of watches and warnings. Includes map discussions, analysis of current weather, and prediction for aviation, severe weather, and flash floods. Prerequisite: MET 3502 and MET 3502L (S)

MET 4532 Hurricanes (3). Hurricane formation, motion, and impacts for undergraduates and beginning graduate students in engineering, physical sciences and social sciences. Prerequisite: Permission of the instructor. (F)

MET 4705 Operational Meteorology I (3). Training at NOAA's Miami facilities, focusing in upper air observations, in preparation for careers in forecasting. Offered for Pass/Fail only. Prerequisites: MET 3502, MET 3502L, MET 4300, and permission of the instructor.

MET 4706 Operational Meteorology II (3). Second semester training at NOAA's Miami facilities, focusing on use of AWIPS system and forecasting procedures, in preparation for careers in forecasting. Offered for Pass/Fail only. Prerequisites: MET 4705 and permission of the instructor.

MET 4750 Techniques for Earth System Modeling (3). Numerical techniques for modeling meteorological, hydrological, and geophysical phenomena using Python and FORTRAN90. Includes problem definition, solution, graphics and interpretation of results. Prerequisites: MET 3003, MAC 2311, MAC 2312 (S in alternate years)

MET 4910 Undergraduate Research in Meteorology (1-10). Individual supervised research in meteorology. May involve observational, modeling, or bibliographic investigations. Variable credit up to 10 credits. Offered for Pass/Fail only. Prerequisites: MET 3003, one other 3000 or 4000-level MET course, and permission of the instructor.

MET 4912L Meteorology Honors Research (1-3). Individual meteorological research under the supervision of faculty in meteorology in the student's field of interest. Offered for Pass/Fail only. Prerequisite: Admission into Geoscience Honors Major.

MET 4937 Senior Seminar in Atmospheric Science (1). Geoscience topics are researched, presented and discussed by students. Students develop knowledge of current research trends and written and verbal science communication skills. Prerequisites: Permission of instructor.

MET 4941 Internship in Meteorology (0-3). Practical meteorological work experience supervised by meteorology faculty at local media outlet, forecast office of laboratory. Offered for Pass/Fail only. May be repeated for credit. Prerequisites: Permission of the instructor.

MET 4970 Meteorology Honors Thesis (1-6). Preparation of honors thesis and research seminar. Offered for Pass/Fail only. Prerequisites: MET 4912L and permission of the instructor.

MET 5016 Physics of Atmospheres I (3). A quantitative examination of atmospheric radiation, thermodynamics and clouds, with a brief introduction to dynamics and applications to weather and climate. Prerequisites: Senior or first-year graduate student in physical science, computer science, or engineering.

MET 5017 Physics of Atmospheres II (3). Continuing examination of atmospheric dynamics, waves and instabilities, with applications to models, weather and climate. Prerequisites: Senior or first-year graduate student in physical science, computer science, or engineering.

MET 5105 Planetary Climate Change: Processes and Impacts (3). Interdisciplinary study of the reasons the Earth's climate is changing, the climates past and expected future variations, impacts on the human and natural environments, and ways to reduce them. Prerequisite: Graduate standing.

MET 5135 Climate Dynamics (3). Global energy cycle, atmospheric radiative transfer, surface energy balance, hydrologic cycle, atmosphere/ocean circulation, climate feedbacks, natural variability, anthropogenic climate change. Prerequisite: Graduate standing.

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 5312 Atmospheric Dynamics II (3). Second graduate-level course in Atmospheric Dynamics. Topics include 2 and 3-dimensional Rossby waves, baroclinic and other instabilities, ageostrophic motions, and general circulation. Prerequisites: Atmospheric Dynamics I and graduate standing in Atmospheric Sciences.

MET 5355 Severe and Hazardous Weather (3). Focuses on introducing thunderstorms, squall lines, mesoscale convection systems, and their interactions with synoptic scale weather. Prerequisites: MET 3003 or permission of the instructor.

MET 5365 Techniques for Earth System Modeling and Research (3). Model development for meteorology, hydrology, and geophysics using Python and FORTRAN. Includes model formulation, architecture and approximations, and synthesis of results. Prerequisite: Permission of the instructor.

MET 5412 Remote Sensing in Meteorology (3). An overview of satellite and radar remote sensing including the principles of atmospheric radiative transfer, the retrieval of atmospheric variables, and basic principles of interpretation. Prerequisites: PHY 2048 and 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.

MET 5533L Weather Discussion and Analysis (1). Focus on analysis and forecasting of middle-latitude and tropical weather systems. Students will be required to give weather forecast discussions and to work on a research project. Prerequisites or Corequisites: MET 3502 or permission of the instructor.

MET 5561 Midlatitude Synoptic Meteorology (3). Focus on analysis and forecasting of middle-latitude weather systems. Examine the structure and dynamic of these systems by integrating weather observation with the current state of dynamic theory. Prerequisites: MET 3003 or permission of the instructor.

MET 5561L Midlatitude Synoptic Meteorology Lab (1). Focus on analysis and forecasting of middle-latitude weather systems. Develop an understanding of the weather forecasting process, and gain experience in communicating weather forecasts. Prerequisites: MET 3003 or permission of the instructor.

MET 5707 Operational Meteorology Research I (3). Training at NOAA's Miami facilities, focusing in upper air observations, in preparation for careers in forecasting. Offered for Pass/Fail only. Prerequisites: Graduate standing in Atmospheric Science and permission of the instructor.

MET 5708 Operational Meteorology Research II (3). Second semester training at NOAA's Miami facilities, focusing on use of AWIPS system and forecasting procedures, in preparation for careers in forecasting. Offered for Pass/Fail only. Prerequisites: MET 5707 and permission of the instructor.

OCE 2001 Introduction to Oceanography (3). The oceans, their nature and extent. Water of the oceans, chemical balance. Marine provinces, sediments and their relation to sea life and oceanic circulation, coastal provinces, sediments and their relation to sea life and oceanic circulation, coastal and deep-ocean circulation. Waves, tides, tsunamis. One field trip expected.

OCE 3014 Oceanography – GL (3). The ocean origin, physical properties, salinity, temperature, sound. Radiative properties, heat budget and climatic control. Tides, wind-driven motion-monsoon circulation. El Nino phenomenon. Subsurface water masses. Oceanic circulation and paleoclimates. (F,S,SS)

OCE 3014L Oceanography Lab (1). Laboratory investigation of the chemical and physical properties of seawater, ocean water motion and its effects. Corequisite: OCE 3014.

OCP 3002 Physical Oceanography (3). An in depth understanding of the physical properties of the ocean including morphology, chemistry, waves, tides, currents and its interactions with the atmosphere and coastline. Prerequisites: CHM 1045 and PHY 2048 or PHY 2053. (F,S)

SWS 4303 Soil Microbiology (3). Examines biology of soil microorganisms and biologically-mediated chemical transformations occurring in soil ecosystems. Standard soil microbiology techniques will be emphasized. Prerequisite: EVR 4592. (F)

SWS 4303L Soil Microbiology Lab (1). Examination of biology of soil microorganisms and biologically-mediated chemical transformations occurring in soil ecosystems. Standard soil microbiological techniques will be examined. Corequisite: SWS 4303. (F)

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 2010, BSC 2011, CHM 2210, CHM 2211; or permission of the instructor.