

UNIVERSITY OF MIAMI

ABESS CENTER FOR ECOSYSTEM SCIENCE AND POLICY (ECS)

PROPOSAL TO REPEAL THE REQUIREMENT FOR MANY UNDERGRADUATE ECS MAJORS TO COMPLETE A SECOND MAJOR

16 SEPTEMBER, 2013

At its creation in 2004, the undergraduate Ecosystem Science and Policy degree required all majors, whether B.A. or B.S., to complete a second major in any other unit of the University. The reasoning at the time was that graduates would be well served by a second major when seeking further graduate-level education or jobs.

The program has now graduated nine cohorts and the program directors and Abess Center Advisory Committee members have re-examined the curriculum. Over the course of the 2012-2013 academic year, multiple faculty surveyed the B.A. and B.S. requirements, investigated undergraduate policy programs at other institutions, and formulated a new set of requirements for both degrees. These new requirements were presented to the Advisory Committee and after revision were approved by a majority of the members, who also voted to remove the double major requirement.

Most of the top programs in environmental science and policy in the U.S. are single majors. They require, in addition to core courses, a series of electives that allow students to attain deeper understanding in biology, chemistry, ecology, and social sciences. The University of California, Berkeley Department of Environmental Science and Policy, for example, offers five interdisciplinary undergraduate majors: Conservation and Resource Studies, Environmental Sciences, Forestry and Natural Resources, Molecular Environmental Biology, and Society and Environment. All require students to take core courses and then pursue a specialized concentration; none requires a second major. The Duke University Nicholas School of the Environment offers a B.A. in Environmental Sciences and Policy and a B.S. in Environmental Science; again, neither requires a second major. The University of Michigan's School of Natural Resources and Environment offers a B.A. and a B.S. Program in the Environment. The specialization differentiates between B.A. and B.S. by requiring at least 60 credit hours of Math and sciences for the B.S., but does not require a second major.

We believe that environmental science and policy is now an internationally established interdisciplinary field of study; consequently, we should be able to prepare students for multiple post-graduation paths without having to rely on a second major for "backup." Moreover, there are logistical reasons for removing the second major requirement: As it currently stands, some number of students each year come to the program directors saying they are unable to complete all the requirements for a double major while staying on schedule to graduate within four years. This is sometimes due to their desire to pursue two or more additional minors. It is also sometimes due to their desire to fit in a semester of study abroad, which for obvious reasons our program strongly encourages. In addition, we have had students who either transferred or came to the program late in their undergraduate careers; they, too, find it difficult to fit in the double major. Invariably, because ECS requires the second major and virtually no other program does, such students downgrade the ECS major to a minor, often quite reluctantly but with no other option. Each year, we lose one or two students this way, including some of our top achievers.

Without the second major requirement, students will more readily be able to complete an ECS major and will be able to pursue multiple, mutually reinforcing minors. We expect that many students will continue to opt on their own to take a double major, and anticipate that dropping the double major requirement will in no way alter the program's commitment to providing extensive advice and support tailored to particular students' aims.¹ That means that students who voice the intention to pursue, say, an environmental chemistry degree, will be strongly encouraged to take a second major in chemistry.

Overview of new requirements

We have formulated two sets of requirements for the single major in ECS that retain the rigor we believe students need. We will require 57 to 59 credits, allowing students at least 63 to 61 free credits out of the 120 needed for an undergraduate degree. (Note that they will be able to satisfy a cognate for either STEM or People and Society through the ECS major.)

A snapshot of the changes is as follows (details are provided in the accompanying worksheets):

- For both B.A. and B.S. degrees, we retain the same core ECS courses as in the past (including an internship or research project and a capstone course)
- We retain the requirement for Math and Statistics (at least Calculus II/MTH 162 for the B.S. and at least Pre-calculus II/MTH 108 for the B.A.)
- For the B.S., a minor or second major in one of the following is required: BIL, CSC, CHM, GSC, MET, MSC, MTH, CAE)
- For the B.A. and B.S., we add a GIS course requirement, GEG 199, a skill many graduates told us they needed
- For the B.S., we have reconfigured the Science core to achieve breadth of exposure at the introductory level and some degree of specialization at the higher level; in part, this is an attempt to ensure that with the shift to cognates, our students will still be exposed to Biology, Geological Sciences, Marine Science, or Physics
- For the B.A., we shift from the requirement of two Economics or two Political Science courses, to one of each, on the assumption that a basic understanding of the principles of both fields is valuable
- For the B.A., we add an Anthropology requirement, as much of current environmental policy theory has roots in the field
- We do not require but encourage both B.A. and B.S. students to participate in a study abroad program
- For the B.S. and B.A., any course used to fulfill one ECS requirement cannot be used to fulfill another.

Note that in formulating the new requirements we have anticipated changes that will accompany the introduction of cognates in Fall 2013; however, as no one fully knows how

¹ An online survey of ECS alumni conducted in May 2011 revealed that of 17 respondents (total n=86), 16 had gone on to higher study, most in environmentally related fields. Respondents viewed their undergraduate preparation in an overwhelmingly positive light, although when asked directly about the double major requirement, had neither strongly positive nor negative comments about it. At least for these respondents, the requirement was not seen as constituting an essential element of their success in graduate school. Additional anecdotal evidence gathered by the program director from a handful of recent graduates suggests that graduates with an interdisciplinary bent appreciated the second major; however, it is likely that such students would have voluntarily taken a second major even if not required to do so.

this shift will impact students' choices, we are mindful of the fact that we might need to make further adjustments to our requirements over the next four years, as the cognates fully replace the current General Education requirements. We believe that the changes should involve only minor adjustments, but this will depend entirely on how the new system unfolds.

Budget and resources

We anticipate that no additional resources will be needed to effect this change. Should larger institutional forces come into play as cognates phase in, or should dropping the second major requirement for many B.A. and B.S students significantly increases the number of majors, we could need more teaching resources. We envision no other significant budgetary impact.

ECOSYSTEM SCIENCE AND POLICY BACHELOR OF SCIENCE WORKSHEET

Student: _____ Entered ECS: _____
 C #: _____ Expected Grad Date: _____
 Email: _____ Cell: _____ Honors (Y/N) _____
 Additional Major/s: _____
 Minor/s: _____

CORE COURSES (30 cr.)	COURSE TAKEN	SEMESTER TAKEN
ECS 111		
ECS 112		
ECS 113		
ECS 201 or 202		
ECS 232 (or BIL 330)		
ECS 301		
ECS 302		
ECS 403		
6 cr. ECS electives (300-level or higher)	#1	
	#2	
SCIENCE CORE		
Chemistry: CHM 111/113, 112/114‡		
8 cr. Science 110+ w/lab (BIL,GSC,MSC,PHY)		
(max 4 cr. per discipline)		
ECS Science Track courses**	#1	
Track:	#2	
	#3	
	#4	
	#5	
MATHEMATICS (11 cr)		
Calc 2 (MTH 151/152,161/162,171/172)		
Statistics(ECS/MSC204,BIL311,MTH224,PSY204)		
SOCIAL SCIENCE CORE (6 cr.)		
3 cr. Economics/Political Science category *		
3 cr. Social Science Skills category *		

ECS 401 INTERNSHIP		
Internship presentation completed		
Internship write-up completed		
Or ECS 402 RESEARCH		
Research advisor		
Research project completed		
STUDY ABROAD		
TEACHING ASSISTANTSHIP		

Note: Any course used to fulfill one ECS requirement cannot be used to fulfill another. Courses (except 30 cr. ECS core) can belong to a minor, second major or cognate.

‡ **Pre-health and life sciences students will be advised into CHM 121, 221 and 222.**

*See list of approved courses for category

**See list of required courses for tracks

Proposed ECS Bachelor of Science Concentrations

(Note: Additional courses are under consideration at this time.)

Environmental Chemistry

Three of the following (must include 2 labs):

CHM 201 + 205 (Organic Chemistry I + lab) (3 + 1 cr)

CHM 202 + 206 (Organic Chemistry II + lab) (3 + 1 cr)

CHM 360 + 364 (Physical Chemistry I + lab) (3 + 1 cr)

CHM 365 + 464 (Physical Chemistry II + lab) (3 + 1 cr)

CHM 401 (Environmental Chemistry)

(Note: CHM 111/113, 112/114 must be taken before the Chemistry concentration. Fulfillment of the Chemistry concentration earns a Chemistry minor.)

Environmental Health

Three of the following:

CAE 340 (Environmental Pollution)

CHM 201 + 205 (Organic Chemistry I + lab) (3 + 1 cr)

EPH 580 (Vector-Borne Diseases)

MIC 301 (Intro to microbiology and immunology)

MIC 322 (Medical parasitology)

(Note: BIL 150/151, 160/161 and CHM 121, 221, 222 should be taken before the Environmental Health concentration.)

Geology

GSC 260 (Earth Materials) (4 cr)

Plus two of the following:

GSC 360 (Depositional and Diagenetic Systems) (4 cr)

GSC 380 (Paleontology and Stratigraphy) (4 cr)

GSC 410 (Environmental Geochemistry) (3 cr)

GSC 420 (Geophysics) (3 cr)

GSC 480 (Structural Geology) (4 cr)

GSC 550 (Hydrogeology) (3 cr)

(Note: GSC110/114 and 111 should be taken before the Geology concentration. This plus the Geology concentration earns a minor in geological sciences.)

Geospatial Certificate

GEG 199 (Intro to GIS)

GEG 391 (Intermediate GIS)

GEG 392 (Environmental Remote Sensing)

Plus two of the following:

GEG 410 (Intro to Microwave Imaging and SAR)

GEG 491 (GIS and Environmental Modeling)

GEG 545 (Special Topics: Web-GIS)

GEG 545 (Special Topics: Advanced SAR Techniques and Applications)

GEG 545 (Special Topics: GIS in Public Health)

(Note: Fulfillment of the Geospatial Certificate PLUS GEG 110 earns a geography minor. This minor does NOT qualify for an Arts and Sciences BS; students completing the geospatial

certificate concentration must complete an additional minor in one of the following for an Arts and Sciences BS: biology, chemistry, computer science, geology, marine science, mathematics, physics.)

Marine Biology

MSC 230 + 232 (Marine Biology + lab) (3 + 1 cr)

Plus three of the following:

MSC 315 (Marine Biota and Biogeochemical Cycles) (3 cr)

MSC 316 (Global Primary Production) (3 cr)

MSC 323 (Invertebrate Zoology) (4 cr)

MSC 324 (The Biology of Fishes) (3 cr)

MSC 326 (Marine Genomics) (3 cr)

MSC 350 (Survey of Marine Mammals) (3 cr)

MSC 410 (Marine Conservation) (3 cr)

MSC 415 (Coral Reef Science & Management) (3 cr)

MSC 432 (Comparative Ecology of Terrestrial and Marine Ecosystems) (3 cr)

MSC 463 (Marine Conservation Genetics) (3 cr)

MSC 465 (Marine Comparative Immunology) (3 cr)

MSC 460 (Spatial Applications in Marine Science) (3 cr)

(Note: MSC 111 must be taken before the Marine Biology concentration. Fulfillment of the Marine Biology concentration earns a marine science minor.)

Mathematics

MTH 359 (Mathematical Models in Biology and Medicine)

Plus 2 of the following:

MTH 210 (Linear Algebra)

MTH 310 (Multivariable Calculus)

MTH 311 (Intro to Ordinary Differential Equations)

(Note: Calculus II must be taken before the Mathematics concentration. Fulfillment of the Mathematics concentration earns a mathematics minor.)

Other concentrations being considered/under construction:

Climate

Conservation Biology

Courses Accepted for the ECS BS Degree By Category

Economics/Political Science Category (3 cr. for BS)

ECS 377 Topics in Environmental Economics and Development
ECO 211 Economic Principles and Problems: Microeconomics
ECO 212 Economic Principles and Problems: Macroeconomics
INS 102 Global Economics
INS 421 Poverty and the Environment
MSC 345 Economics of Natural Resources and the Environment
POL 201 Intro to American National Government
POL 202 Intro to Comparative Politics
POL 203 Intro to International Relations

Social Science Skills Category (3 cr. for BS)

(Note: ECS B.S. majors without a second major must take a GIS course ... e.g. GEG 199)

APY 410 Disaster and Recovery
BSL 212 Intro to Business Law
BSL/MS 314 Ocean Law
CAD 114 Principles of Advertising
CVJ 106 Multimedia Design
CVJ 341 Web Design
ECS 376 *particular* Topics in Environmental Communication
ECS 377 *particular* Topics in Environmental Economics and Development
EPS 321 Understanding Human Service Organizations
FIN 300 Finance for Non-Business Majors
FIN 302 Fundamentals of Finance
GEG 120 Physical Geography
GEG 199 Intro to GIS
HCS 206 Intro to Public Health
HCS 309 Health and Environment
INS 503 *particular* Special Topics (e.g. Role of Foreign Aid in International Development)
LAS 502 Interdisciplinary Research Methods and Design
MGT 303 Operations Management
MGT 353 Intro to Entrepreneurship
MKT 201 Foundations of Marketing
PHI 110 Critical Thinking
PHI 215 Logic and Law
POL 314 Legislative Processes
POL 342 State and Local Government and Politics
POL 353 Interest Groups and Lobbying
POL 524 Non-profit Organizations: Law, Policy, and Management
PSY 332 Tests and Measurements
SOC 210 Intro to Social Research

ENVIRONMENTAL SCIENCE AND POLICY B.A WORKSHEET

Student: _____ Entered ECS: _____
 C #: _____ Expected Grad Date: _____
 Email: _____ Cell: _____ Honors (Y/N) _____
 Additional Major/s: _____
 Minor/s: _____

CORE COURSES	CREDITS	SEMESTER	NOTES
ECS 111	3		
ECS 112	2		
ECS 113	3		
ECS 201 or 202	1		
ECS 232	3		
ECS 301	3		
ECS 302	3		
ECS 401 or 402	3		
ECS 403	3		
6 cr. ECS electives (300-level or higher)	6		
Subtotal	30		
SCIENCE CORE			
GSC 102, 103, 106, or 110/114	3 or 4		
MSC 101 or 111	3		
6-CR Env. related STEM	6		
Subtotal	12 or 13		
MATHEMATICS			
MTH 108 or higher	3 or 4		
Statistics course (ECS 204, PSY 204, MTH 224, BIL 311, MAS 201)	3		
Subtotal	6 or 7		
SOCIAL SCIENCE CORE			
3 CR ECO 211, ECO 212, or INS 102	3		
3 CR POL 201, 202, or 203	3		
GEG 199	3		
APY 201,202,203, or 204	3		
3 CR Env. related P&S (APY, ARC, ECO, ECS, GEG, HIS, INS, LAS, MAF, POL, SOC)	3		
3 CR 300-level Env. related P&S (APY, ARC, ECO, ECS, GEG, HIS, INS, LAS, MAF, POL, SOC)	3		
Subtotal	18		
Total credits	66 to 69		
ECS 401 INTERNSHIP			
Internship presentation completed			
Internship write-up completed			
OR			
ECS 402 RESEARCH			
Research advisor			
Research project completed			
STUDY ABROAD			
TEACHING ASSISTANTSHIP			

Examples of Environmentally Related People & Society Courses

APY 418 Seminar in Anthropology: Disaster and Recovery 3 CR
APY 435 Anthropology of Nature and Environment 3CR
ARC 543 Seminar in Retrofit of Suburbia 3CR
ARC 594 GIS and Urban Design 3CR
ECO 345 Economics of Natural Resources and Environment 3CR
ECO 351 Economics of Developing Countries 3CR
GEG 341 Geography of World Population Issues 3CR
GEG 370 Conservation of Resources 3CR
GEG 371 Environmental Geography: Current Issues 3CR
GEG 391 Intermediate GIS 3CR
GEG 392 Remote Sensing of the Environment 3CR
GEG 430 World Cities 3CR
GEG 471 Ecological Biogeography 3CR
GEG 491 GIS and Environmental Modeling 3CR
GEG 511 Field Studies in Geography 3CR
GEG 522 Urbanization in the Developing World 3CR
GEG 570 Gender and Development 3CR
HIS 368 Nature and the Environment in American History 3CR
INS 322 Economic development and the Environment 3CR
INS 421 Poverty and the Environment 3CR
INS 476 Science, the Environment, and Policy 3CR
LAS 302 Topics in Latin American Studies: Tourism and Conservation (Bocas del Toro, Panama) 3 CR
MAF 501 Political Ecology of Resources Management 3CR
MAF 502 Economics of Natural Resources 3CR
MAF 510 Environmental Planning and the Environmental Impact Statement
MAF 518 Coast Zone Management 3 CR
POL 314 Legislative Process 3 CR
SOC 210 Introduction to Social Research 3 CR