EP.06.21

PROPOSAL TO THE SENATE COMMITTEE ON EDUCATIONAL POLICY

TITLE OF PROPOSAL:

Proposal to Establish the BSLAS in Earth Systems, Environment, and Society (Sciences and Letters Curriculum) in the College of Liberal Arts and Sciences

COLLEGE CONTACT: Ann Mester, Assistant Dean Liberal Arts and Sciences

SPONSORS:

Donald Wuebbles
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OFFICE OF THE SENATE

BRIEF DESCRIPTION:

Humanity faces great challenges in the 21st Century to understand and limit our impact on the Earth System. In order to address these challenges, it is essential for citizens to understand the nature and implications of environmental change, how it at once influences and is influenced by individual and social actions. In addition to highly trained researchers with strong backgrounds appropriate for solving specific technical problems, it is also necessary to cultivate an informed citizenry equipped to understand the choices to be made in areas ranging from environmental protection to energy policy, from land-use issues to space exploration. The undergraduate years provide an ideal opportunity for students to acquire the knowledge and skills they need to make new strides in understanding the technical aspects of the Earth System, and to develop an appreciation of the interactions between society and the Earth System sufficient to make informed policy choices. This University has the opportunity to take a leadership role in an innovative direction in undergraduate education, offering a new and unique perspective and experience to students interested in engaging with these fundamental topics.

Representatives from seven units (Atmospheric Sciences, Geography, Geology, History, Integrative Biology, Plant Biology, Sociology, and Statistics) within the College of Liberal Arts and Sciences (LAS) have put together an undergraduate interdisciplinary degree program that integrates aspects of the physical sciences, biological sciences, social sciences, and humanities into a holistic, systems-focused approach to studying the Earth. The proposed major will provide students with a broad understanding of our planet, incorporating the solid earth, atmosphere, oceans, and biosphere within the context of human sociocultural, political, and economic activities. Although primarily situated within LAS, the program will actively connect with other programs on campus to provide students with a broad, but substantive, exposure to topics of the

Earth System. This understanding will be built upon a foundational survey of the basic physical and social sciences and reinforced through specialization within advanced coursework, participation in an ESES colloquium series, and completion of a capstone course or project. The program will initially be housed directly within the College of Liberal Arts and Sciences (similar to the existing interdisciplinary program in International Studies). It will eventually be moved to the School of Earth, Science, and Society that is currently under development. (See Appendix A.)

The curriculum is divided into two options: Science of the Earth System (SES) and Society and the Environment (SAE). After completing an introductory sequence of courses and a two-semester, 200-level interdisciplinary colloquium on issues of the Earth System (ESES 200), students will select one of these options to focus either in the sciences or the social sciences and humanities. Students will be exposed to upper level courses from both areas so that their skills and knowledge base are broadened at both the introductory and upper levels of their coursework. The proposed curriculum also leaves open the opportunity for students to tailor their coursework into a more focused substantive specialization within either of the two options. A sample outline for such a specialization is presented in Appendix D.

This program is designed to prepare students for a variety of career trajectories (see Appendix E). The mix of technical and social skills emphasized prepares students for a range of positions in both the public and private sectors. Additionally, students receive a background that will prepare them for both professional degree programs (law and public administration), and graduate study in a variety of interdisciplinary or traditional physical and social science programs.

JUSTIFICATION:

Issues spanning the physical and social dimensions of the Earth System have increased dramatically in number and salience in the past two decades. The opportunity has arisen for an enterprising university to forefront these concerns and to develop a curriculum that will bring together the strengths of a variety of disciplinary perspectives into a unified, systems-focused approach. This major will provide a comprehensive interdisciplinary liberal arts education focused on issues of the Earth System and the environment, presenting an undergraduate experience distinct from any currently available on this campus and at peer institutions throughout the country.

Currently, an array of teaching and research related to the Earth System is being carried out across campus. However, these perspectives are spread out and generally disconnected within various departments, particularly within the College of Liberal Arts and Sciences (LAS). This program offers students and faculty an opportunity to bring these different threads together to construct a cohesive, integrative program of study.

Institution of this program would place the University of Illinois at Urbana-Champaign at the vanguard of a new and exciting intellectual and educational movement. In addition to being the only program of its kind in the State of Illinois, it would be one of only a handful of programs throughout the country dedicated to bringing together the physical, biological, and social

dimensions in the study of the *Earth System.* With the support of the NASA/USRA Earth System Science Education for the 21st Century Program (ESSE 21), this major is poised to provide a template for a new and innovative approach to undergraduate training.

It is the unique focus on the Earth System that provides the intellectual core of the program, approaching the natural and human environment as a complex system in which the solid planet, oceans, atmosphere, and life (human and non-human) interact and shape each other. Rather than focusing on the intersection of physical and social processes in the area of environmental management and conservation, this major emphasizes the understanding of environmental issues as the products of complex, dynamic interactions of physical and social systems. In addition to being an innovative intellectual foundation for undergraduate education, this systems approach provides a backbone upon which to layer both breadth of exposure to different disciplinary perspectives and substantive depth in understanding the scientific or social/human dimensions of the Earth System.

Within the overall systems approach, this program distinguishes itself with strong grounding in both the geophysical dimensions and the social and human dimensions of the Earth System. The Departments of Atmospheric Sciences, Geology, and Geography currently offer extremely popular, highly populated general education courses related to the Earth Sciences. Many students taking these courses have expressed interest in a program that transcends the traditional disciplinary boundaries and brings these geophysical systems together with one another and in relation to biological/ecological and social systems.

Along these lines, this program of study offers a substantively unique approach to incorporating social and human dimensions into the study of the environment. Existing programs related to the environment and the Earth System frame the human dimensions almost exclusively in terms of public policy and economic studies. This program, however, casts a wider net within the social sciences and humanities to provide a range of perspectives and tools for the analysis of the human dimensions of the Earth System. In addition to policy and economic considerations, this program will benefit from courses within areas such as Sociology, History, Human Geography, and Psychology, to name a few.

Above all else, this program is meant to offer a traditional liberal arts and sciences educational experience related to the Earth System. Although benefiting from exposure to research and coursework outside LAS, this major is dedicated to the principles of traditional liberal arts education, balancing intellectual rigor with a breadth in exposure to different viewpoints and approaches to the Earth System.

BUDGETARY AND STAFF IMPLICATIONS:

a. Additional staff and dollars needed: The staff will be coordinated between the departments involved within LAS and departments outside of LAS such that no new positions need to be created initially. Primary administrative responsibility will be shared between the Departments of Atmospheric Sciences, Geography, and Geology. As enrollment demands grow beyond the resources of the core departments, it may be necessary in the future to create a full time advising position and admissions secretarial

position. Initially this can be handled through existing staff in the departments involved in the major. Depending on the size of the major, additional instructional resources might be necessary to maintain lab sections for GEOG 379.

b. Internal reallocations: No changes are currently anticipated for the teaching loads of tenure-track faculty involved in the program. Instruction in ESES 200 will be shared among the three primary departments as part of the normal faculty load. As the major grows, future course development and added pressures on existing course sizes and offerings will have to be considered.

c. Effect on course enrollment in other departments and explanations of discussions with representatives of those departments: Although it is difficult to assess and highly uncertain, we anticipate an enrollment of 200 majors or more once the program has been firmly established. However, impact on course enrollment is expected to be minimal due to the flexibility in course requirements built into the curriculum.

d. Impact on library, computer use, laboratory use, equipment, etc.: Extra expenses are not being requested with this proposal, although additional support for library renovation, website development and maintenance, recruiting expenses, and other operating expenses may become necessary within a few years of implementation of the major. We anticipate equipment and facilities costs and needs to be minimal initially, but they will grow as the major increases in size. Depending on the size of the major, additional computer resources might be necessary to maintain lab sections for GEOG 379.

GUIDELINES FOR UNDERGRADUATE EDUCATION:

The requirements for satisfying the BSLAS in Earth Systems, Environment, and Society (Sciences and Letters) are developed to satisfy all of the guidelines for undergraduate education at the University of Illinois. The course requirements for this undergraduate major are designed to develop the students intellectually in their ability to read and listen, to write and speak, to observe and respond critically, to think clearly, critically, and creatively, to think quantitatively and qualitatively, and to develop understanding and attitudes appropriate to a graduate of this institution of higher learning. The curriculum is aimed at achieving the breadth of understanding of fundamental physical and social sciences appropriate to a wide range of career possibilities.

CLEARANCES:

Donald J. Wuebbles 3/22/05

Department of Atmospheric Sciences

B J Mah 3/28/05

Department of Geography

Stephen Marshak 3/25/05

Department of Geology

Anne DeMyster 11/23/05

College of Liberal Arts and Sciences

Office of the Provost

STATEMENT FOR PROGRAMS OF STUDY CATALOG:

Earth Systems, Environment, and Society
www.eses.uiuc.edu
The major in Earth Systems, Environment and Society offers a unique, multidisciplinary liberal arts education in the scientific and human dimensions of the Earth System. The curriculum balances a broad exposure to diverse disciplines at an introductory level with a more focused substantive course of study at the upper level. To do this, the major offers two options within which majors can specialize: Science of the Earth System and Society and the Environment.

Both options will prepare students for a variety of career paths in either the private or the public sector, as well as for graduate study. The interdisciplinary background in both scientific and human aspects of environmental problems will prepare students for a variety of positions with state and federal regulatory agencies, research institutions, consulting firms, and non-governmental education and advocacy organizations. The major also provides a platform for entry into professional schools (e.g., law and public policy programs), as well as graduate study in a variety of physical and social scientific disciplines and interdisciplinary programs related to the environment.

All students are required to participate in an introductory interdisciplinary colloquium series and a project-oriented capstone experience in their senior year. Students are encouraged to pursue internship and research projects as part of their course of study.

MAJOR IN SCIENCES AND LETTERS CURRICULUM

Email: program_info@eses.uiuc.edu

Degree Title: Bachelor of Science in Liberal Arts and Sciences

Minimum required major and supporting courses equate to 50 hours.

General education: The LAS General Education requirements are set up so that students automatically complete the Campus General Education requirements.

Minimum hours required for graduation: 120 hours

Departmental distinction: Students who maintain grade point averages of at least 3.3 in all courses within the major and who fulfill the Capstone requirement with a faculty-guided individual research project are recommended for graduation with distinction.

HOURS	REQUIREMENTS

Students must complete the ESES Introductory Core requirements listed below and select one option in consultation with an academic advisor.

12-14	ESES Introductory Core

6 Introduction to Society and the Environment
(Choose two courses from approved list)

3-4 Introduction to Earth's Physical Systems
(Choose one course from approved list)

3-4 Introduction to Earth's Biological Systems
(Choose one course from approved list)

10 Earth Systems Technical Skills and Senior Experience

4 ESES 200- ESES Colloquium (ESES 200 is a 2 hour course to be repeated to 4 hours)

3 GEOG 379-Introduction to GIS

3 ESES 401-ESES Capstone

Society and the Environment (SAE) Option

12 SAE Advanced Core

A minimum of 12 hours of advanced coursework (300- and 400-level courses) in an intellectually or professionally coherent program approved by an advisor is required, including at least one 300-or 400-level course within the Science of the Earth System (SES) curriculum. These courses should be used to help meet the LAS requirement of 21 hours of 300-or 400-level courses overall, 12 hours of 300-or 400-level courses in the major. It is strongly recommended that students complete the LAS requirement with 15 hours of 300-or 400-level courses related to the SAE concentration and 6 hours from the SES.

15-16 Cognate Course Work*

9 Introductory Social Science
(Select three courses from approved list)

3 Statistics
(Select one course from approved list)

3 Economics (ECON 101 or ECON 102)

*HIGHLY RECOMMENDED: Computer Science 100/110x

Science of the Earth System (SES) Option

12 SES Advanced Core

A minimum of 12 hours of advanced coursework (300- and 400-level courses) in an intellectually or professionally coherent program approved by an advisor is required, including at least one 300- or 400-level course within the Society and the Environment (SAE) curriculum. These courses should be used to help meet the LAS requirement of 21 hours of 300-or 400-level courses overall, 12 hours of 300-or 400-level courses in the major. It is strongly recommended that students complete the LAS requirement with 15 hours of 300-or 400-level courses related to the SES concentration and 6 hours from the SAE.

15-16 Cognate Course Work*

3 CHEM 102-General Chemistry I
1 CHEM 103-General Chemistry Lab I
5 MATH 220-Calculus I
3 STAT 100- Statistics
4 Physics
(Select one course from approved list)
*HIGHLY RECOMMENDED: Computer Science 101/110x

Students planning on attending graduate school in Earth Systems science, Geoscience, or Atmospheric Science should take at minimum MATH 225 (Introductory Matrix Theory), MATH 230 (Calculus II), MATH 242 (Calculus of Several Variables), and MATH 385 (Intro to Differential Equations); CHEM 104 and 105 (General Chemistry II and Lab); and either PHYS 101, 102 or PHYS 211, 212, and 213 (the latter sequence is preferred). All students wishing to attend graduate school in any field should discuss necessary supplementary coursework with their advisor as early as possible. Sample programs of study are available at the ESES website (www.eses.uiuc.edu).

Twelve hours of 300- or 400-level courses must be taken on this campus.

*Second majors or campus-wide minors may be used to fulfill this requirement upon approval of an advisor.

*Substitutions may be made with advisor approval.

All foreign language requirements must be satisfied.

A Major Plan of Study form must be completed and submitted to the LAS Student Affairs Office before the end of the fifth semester (60-75 hours). Study abroad courses may be substituted for major and minor requirements with approval of advisor.

PROPOSED EFFECTIVE DATE: August 2006

Appendices are available for review in the Senate Office.