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GRADUATE

NEW/REVISED/DELETED GRADUATE PROGRAMS COVER SHEET
(Degree Programs, Sequences, Graduate-Level Certificates)
Graduate Curriculum Committee
2007-08

Deadlines for receipt by Graduate Curriculum Committee:
Revised Degree Program, Sequence, Graduate Certificates: October 1, 2007, for inclusion in 2008-09 catalog.
New Sequence, New Graduate Certificate: September 14, 2007, for inclusion in 2008-09 catalog.
New Degree Program: February 8, 2008, for inclusion in 2009-10 catalog.

DEPARTMENT/SCHOOL_Biological Sciences_____ DATE __4/23/07_____
TITLE OF DEGREE, SEQUENCE, OR CERTIFICATE _M.S. Sequence in Bioenergy Sciences_____

Proposed Action: (Refer to Part I, Section C of *GCC Proposal Guidelines and Procedures.*)

____X____ New* (Check one):
- _____ Degree Program** (goes beyond Graduate Curriculum Committee)
- __X__ Sequence (goes beyond Graduate Curriculum Committee)
- _____ Post-Master's Graduate Certificate (goes beyond Graduate Curriculum Committee)
- _____ Post-Baccalaureate Graduate Certificate (goes beyond Graduate Curriculum Committee)
- _____ Graduate Certificate

_____ Change in requirements for: (Check one.)
_____ Degree Program _____ Sequence _____ Certificate

_____ Other program revisions

_____ Deletion of: (Check one.)
- _____ Degree Program (goes beyond Graduate Curriculum Committee)
- _____ Sequence (goes beyond Graduate Curriculum Committee)
- _____ Post-Master's Graduate Certificate (goes beyond Graduate Curriculum Committee)
- _____ Post-Baccalaureate Graduate Certificate (goes beyond Graduate Curriculum Committee)
- _____ Graduate Certificate

*Attach approved *Request for New Program Approval: Reporting of Financial Implications* form (available at www.academicsenate.ilstu.edu/documents.html).
**Obtain the New Program Request (NEPR) format from the Office of the Provost.

Summary of proposed action. For all proposals, provide current title and current catalog copy. Provide new title and new catalog copy for new programs, and for revised programs if catalog copy/title is altered. For revised programs, provide a summary of the changes. (Refer to New/Revised/Deleted Programs checklist in *GCC Guidelines and Procedures.*)

Routing and action summary:

1. _____ _____
Dept./School Curriculum Committee Chair — Date Approved

2. _____ _____
Department Chair/School Director — Date Approved

3. _____ _____
College Curriculum Committee Chair — Date Approved

4. _____ _____
College Dean — Date Approved

5. _____ _____
Teacher Education Council Chair — Date Approved
(28 copies to Dean of College of Education)

6. _____ _____
Graduate School — Date Approved

Submit 10 copies of proposal to the Graduate Curriculum Committee. In addition, for new and deleted degree programs, sequences, and Post-Baccalaureate and Post-Master's certificates, submit an electronic version (MS Word format). These proposals are routed by GCC to the Academic Senate. The Senate requires electronic submission of all materials for posting to the Senate Web site.

PROGRAM DESCRIPTION AND EXPLANATIONS

Institution: Illinois State University

Responsible department/school or administrative unit: Department of Biological Sciences

Proposed Program Title: M.S. Sequence in Bioenergy Sciences

Previous program title (if applicable): NA

CIPS classification (applicable to new program): 26.0101

Date of Implementation: June 2008

Description of proposed program: The Bioenergy Sciences Master's degree sequence will provide student with the background to conduct thesis research focusing on questions related to biological and/or environmental aspects of using/engineering plants and microbes for the production of bio-based fuels. Ultimately, students will be prepared for pursuing higher degrees or entering professions related to bioenergy. Students can choose between a biotechnology-based track and an ecology/conservation biology-based track. Students in each track will be required to take two core courses (BSC365 Bioenergy Plant/Microbe Biology and the Environment, 3 cr. (proposal attached); and BSC420.38 Seminar in Bioenergy Sciences, 1 cr. (recently approved). These courses will foster interactions among the sub-disciplines and provide students with a broad educational background for understanding important issues related to the development of bioenergy-related plants and microbes and managing their use and release into the environment.

The Bioenergy Sciences MS sequence will be an integral part of the College of Arts and Sciences' Energy Science and Education Program of Excellence (abbreviated Energy Science PoE). The Energy Science PoE is an interdisciplinary campus-wide program involving participants from the Departments of Biological Sciences, Chemistry, Geography/Geology, Physics, Health Sciences, and Agriculture. The Energy Sciences PoE provides students with both graduate and undergraduate Energy Science-related research and education training in preparation for the growing number of Energy Science-related jobs in Illinois and beyond.

Course offerings for the Bioenergy Sciences MS sequence will be as follows:

<u>Biotechnology Bioenergy Sciences track</u>
Required courses (23 credits total):
BSC365 Bioenergy Plant/Microbe Biology and the Environment (3 cr.)
BSC353 Biotechnology Lab I (3 cr.)
BSC354 Biotechnology Lab II (3 cr.)
BSC415 Advanced Cell Biology (3 cr.) or BSC466 Microbial Physiology (3 cr.)
BSC419 Mol. Biol. of the Gene (4 cr.) or BSC 467 Microbial Genetics (4 cr.)

BSC450 Issues in Biotechnology (2 cr.)
BSC420.38 Seminar in Bioenergy Sciences (1 cr.)
BSC499 Thesis Research (4 cr. total)
Elective courses (7 credits total):
Students can choose among graduate level courses either within the Department of Biological Sciences or in other departments. Courses from other departments should include content that is pertinent to the energy sciences (eg. CHE 380.19 Modern Electrochemistry; GEO 341 Climate and Global Environmental Change; AGR355 Plant Biotechnology and Breeding; AGR 356, Plant Propogation; new energy-related courses are being developed in participating Energy Science PoE departments). It is anticipated that relatively few students entering the Bioenergy Sciences MS sequence will take any one elective course. Therefore, this MS sequence will not overburden courses in any department.

Ecology/Conservation Bioenergy Sciences track
Required courses (22 or 23 credits total):
BSC365 Bioenergy Plant/Microbe Biology and the Environment (3 cr.)
BSC404 Population Ecology (4 cr.) or BSC405 Community Ecology (4 cr.)
BSC406 Conservation Biology (3 cr.) or BSC337 Restoration Ecology (4 cr.)
BSC471 Evolutionary Population Genetics (3 cr.)
BSC490 Biostatistics (3 cr.)
BSC420.27 Biostatistics Lab. (1 cr.; taken concurrently with BSC490)
BSC420.38 Seminar in Bioenergy Sciences (1 cr.)
BSC499 Thesis Research (4 cr. total)
Elective courses (7 or 8 credits total):
Students can choose among graduate level courses either within the Department of Biological Sciences in other departments. Courses from other departments should include energy science-related content (see above).

Catalogue Copy:

Master's in Biological Sciences

. . .Students may design with advisors an individual plan of study or elect to pursue a sequence within the M.S. program in (1) Behavior, Ecology, Evolution, and Systematics (BEES), (2) Bioenergy Sciences (3) Biomathematics, (4) Biotechnology, or (5) Conservation Biology, each of which includes specific requirements (see below).

Bioenergy Sciences: Students may elect to pursue a sequence in Bioenergy Sciences, a course of study that provides students with a strong conceptual background in biological and environmental aspects of using/engineering plants and microbes for the production of bio-based fuels. Students successfully completing this sequence should be competitive for admission into PhD programs and/or for acquiring bioenergy related jobs in industry, non-profits, government agencies, or academia. Students can choose between a biotechnology-based track and an ecology/conservation biology-based track. In addition

to 4 credit hours of thesis, students are required to take the following: Biotechnology-based track: BSC353, 354, 365, 415 or 466, 419 or 467, 450, 420.38, 420.xx (student's choice), 7 hours of electives; Ecology/Conservation Biology-based track: BSC404 or 405, 406 or 337, 365, 471, 490, 420.27, 420.38, 7 or 8 hours of electives. For further information, see the Department's Web site at www.bio.ilstu.edu.

Rationale for proposal:

The scientific community is in broad agreement that greenhouse gas emissions from the burning of fossil fuels are causing global temperature increases that will result in significant and long-lasting climate change. If left unchecked, global warming will result in wholesale destruction of ecosystems and catastrophic rises in sea levels. The United States and the world face major challenges in developing sustainable and dependable energy supplies that do not contribute to climate change and that can supplant our dependence on foreign oil. The Bioenergy Sciences MS Sequence is designed to educate students about the affects that climate change has and will have on ecosystems, and about efforts being made to develop bioenergy crops, microbes, and technologies to generate biofuels that can replace fossil fuels on a sustainable basis and sequester carbon. This program will provide research opportunities in Bioenergy Sciences-related areas including biotechnology, molecular genetics, biochemistry, microbiology, conservation biology, and ecology, culminating in thesis-based Master's degrees. Graduates of this MS sequence will be competitive for jobs in industry, in government, in non-profits, or for transition into PhD certificate programs. Because of the abundant farmland and farm-based industries in Illinois, as well as the vulnerability of Illinois' water systems and conservation lands to environmental change, a Bioenergy Sciences MS Sequence at Illinois State University is geographically well positioned to meet the growing demands for a trained workforce in bioenergy-related disciplines. In addition, the Bioenergy Sciences MS Sequence will be an integral and indispensable part of the Energy Science and Education Program of Excellence within the College of Arts and Sciences.

Expected impact of proposal on existing campus programs: The proposed Bioenergy Sciences MS Sequence will not overburden existing campus programs. We anticipate that the creation of the Sequence will help to attract a modest number (3-5 per year) of high quality M.S. students to the Department of Biological Sciences' graduate program. The program has the capacity to accept these additional students.

Expected curricular changes, including new courses: Two new courses will be required for the new Bioenergy Sciences MS Sequence: the 3 credit BSC365 (Bioenergy Plant/Microbe Biology and the Environment) and the 1 credit BSC420.38 (Seminar in Bioenergy Sciences).

Anticipated staffing arrangements: The two new courses (BSC 365 and BSC 420.38) will initially be taught by Dr. John Sedbrook, who is a tenure track faculty member in the Department of Biological Sciences and Coordinator of the Energy Science and Education Program of Excellence in the College of Arts and Sciences.

Anticipated funding needs and source of funds: Establishment of the Sequence requires no new funds.