UNIVERSITY FACULTY SENATE FORMS

Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. For more information, call the Faculty Senate Office at 831-2921.

Submitted by: Allen A. Jayne **Phone:** 831-7245

Department: Civil and Environmental Engineering **Email address**: ajayne@udel.edu

Action: Add a Minor in Sustainable Infrastructure

(Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

Effective term: 13F
(use format 04F, 05W)

Current degree: not applicable
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed change leads to the degree of: not applicable
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed name: Minor in Sustainable Infrastructure
Proposed new name for revised or new major / minor / concentration / academic unit (if applicable)

Revising or Deleting:

Undergraduate major / Concentration: not applicable
(Example: Applied Music – Instrumental degree BMAS)

Undergraduate minor: not applicable
(Example: African Studies, Business Administration, English, Leadership, etc.)

Graduate Program Policy statement change: : not applicable
(**Must attach** your Graduate Program Policy Statement)

Graduate Program of Study: not applicable
(Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)

Graduate minor / concentration: : not applicable

Note: all graduate studies proposals must include an electronic copy of the Graduate Program Policy Document, highlighting the changes made to the original policy document.

List new courses required for the new or revised curriculum. How do they support the overall program objectives of the major/minor/concentrations)?
(Be aware that approval of the curriculum is dependent upon these courses successfully passing through the Course Challenge list. If there are no new courses enter "None")

One new course will be a required course for the proposed minor (recently approved and placed in course inventory):

1) CIEG402 Introduction to Sustainability Principles in Civil Engineering: This course provides an introduction to the principles of sustainability and considers the implication of these principles to the practice of civil engineering. Course includes presentation of life cycle assessment techniques, including software applications; discussion of green building materials; evaluation of specific materials in consideration of their use in green construction; and discussion of various sustainable construction standards such as LEED, BREEAM, Green Globes, SITES, etc. At the completion of the course, students will have the ability to define sustainability in their own words, critically evaluate alternative building materials, demonstrate life-cycle assessment techniques as part of the evaluation process, and apply the requirements of recognized sustainable assessment standards.

One new course will be offered as a core elective for the proposed minor (also recently approved and placed in course inventory):

2) CIEG403 Sustainability Applications in Infrastructure: This course emphasizes the application of sustainability principles to civil engineering infrastructure. The course includes application of life cycle assessment techniques for various construction materials; evaluation of economic, environmental, and social impacts of infrastructure projects; comparisons and cost-benefit analyses of alternative design solutions; and integration of recognized standards into the assessment process. Recent examples of sustainable design and innovation are demonstrated through the use of case studies. At the completion of the course, students will have the ability to compare the long-term benefits of alternative engineering design solutions, define the impact of infrastructure development projects, and assess the triple bottom line for proposed infrastructure projects.

Explain, when appropriate, how this new/revised curriculum supports the 10 goals of undergraduate education: http://www.ugs.udel.edu/gened/

The proposed Minor in Sustainable Infrastructure supports the following goals of undergraduate education:

2. Learn to think critically to solve problems.

The coursework associated with this minor will challenge students to consider environmental, social, and economic implications of civil engineering development. For most students this will be a new, fundamentally different perspective from which to approach the problems facing the civil engineering profession.

4. Engage questions of ethics and recognize responsibilities to self, community, and society.

Responsibilities to community and society form the basis of sustainability, as the sustainability principles require engineers to consider the impact of development on the environment, community, and society – both present impact and potential future impact.

Identify other units affected by the proposed changes:
(Attach permission from the affected units. If no other unit is affected, enter "None")

See attached support letters from the following departments:

Department of Business Administration: BUAD429 is an elective for the proposed minor; BUAD309 is a prerequisite for this course.

Center for Energy and Environmental Policy: ENEP410 is an elective for the proposed minor; this course has no prerequisites.

Department of Economics: ECON311 and ECON676 are electives for the proposed minor. ECON151 and ECON152 are prerequisites for ECON311; there are no prerequisites for ECON676.

Department of Electrical and Computer Engineering: ELEG415 and ELEG491 are electives for the proposed minor; neither course has prerequisites.

Department of Geography: GEOG422 and GEOG434 are electives for the proposed minor; neither course has prerequisites.

Department of Marine Science and Policy: MAST676 is an elective for the proposed minor; this course has no prerequisites.

Department of Mechanical Engineering: MEEG435 is an elective for the proposed minor; MEEG332 is a prerequisite for this course.

Department of Political Science & International Relations: POSC311 and POSC350 are electives for the proposed minor; neither course has prerequisites.

Department of Philosophy: PHIL448 is an elective for the proposed minor; this course has no prerequisites.

School of Public Policy and Administration: UAPP406, UAPP448, UAPP452, and LEAD451 are electives for the proposed minor. LEAD100 is a prerequisite for LEAD451; none of the listed UAPP courses have prerequisites.

Department of Sociology & Criminal Justice: SOCI471 is an elective for the proposed minor; this course has no prerequisites.

Describe the rationale for the proposed program change(s):
(Explain your reasons for creating, revising, or deleting the curriculum or program.)

In the two decades since the idea of sustainability was first applied to the built environment, the resulting movement has gained considerable strength. Over 32,000 building projects have been registered with the US Green Building Council, over 200,000 projects have been registered through the Building Research Establishment Environmental Assessment Method international standard, and over fifty countries worldwide have established national standards for sustainable construction. The application of sustainability principles has expanded to all aspects of the built environment, including site planning, storm water management, green materials, construction, and transportation planning. Civil engineers, as planners and designers of society's infrastructure, are at the forefront of the sustainable infrastructure effort.

The objective of this minor is to provide our undergraduate students with the knowledge and skills needed to contribute to this vital endeavor. With this as the goal, students graduating with a minor in sustainable infrastructure will have acquired:

- An understanding of the principles of sustainability.
- The fundamental tools needed to assess sustainability.
- The ability to evaluate the impact of proposed infrastructure development on limited natural resources.
- The ability to recognize and assess the political, economic, environmental, and social impacts of infrastructure development.
- The insight to develop solutions that minimize the effect of infrastructure development on the local community and across global boundaries.

The minor is open to all majors, though several courses included as electives in the minor may require completion of prerequisite courses for students in some majors. Availability of this minor, along with other sustainability minors, will strengthen the University's commitment to the Initiative for the Planet and its role as The Engaged University.

Program Requirements:
(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the current curriculum and **include a side-by-side comparison** of the credit distribution before and after the proposed change.)

A Minor in Sustainable Infrastructure may be earned by a student in any University bachelor's degree program. To receive a Minor in Sustainable Infrastructure, the student must successfully complete a minimum of 15 credits as described below with a minimum grade of C- in each course.

All students must complete the following core course:
• CIEG402 Introduction to Sustainability Principles in Civil Engineering.....3 credits

All students must complete one of the following core courses:
• CIEG403 Sustainability Applications in Infrastructure.....3 credits
• CIEG465 Engineers Without Borders.....3 credits

All students must complete three of the following sustainability-related breadth courses:
• ECON311 Economics of Developing Countries.....3 credits
• ENEP410 Political Economy of Environment.....3 credits
• LEAD451 Leadership for Sustainability.....3 credits
• BUAD429 Sustainability and Green Business.....3 credits
• GEOG422 Resources, Development, and the Environment.....3 credits
• POSC311 Politics of Developing Nations.....3 credits
• SOCI471 Disasters, Vulnerability, and the Environment.....3 credits
• POSC350 Politics and the Environment.....3 credits
• MAST676 Environmental Economics.....3 credits
• GEOG434 Plan Sustainable Communities & Regions.....3 credits
• UAPP452 International Development Policy & Administration.....3 credits
• PHIL448 Environmental Ethics.....3 credits
• ELEG415 Electric Power and Renewable Energy Systems.....3 credits
• ELEG491 Ethics/Impacts of Engineering.....3 credits
• MEEG435 Wind Power Engineering.....3 credits
• FREC343 Environmental Economics.....3 credits

ROUTING AND AUTHORIZATION: (Please do not remove supporting documentation.)

Department Chairperson _____ Date_____

Dean of College _____ Date_____

Chairperson, College Curriculum Committee _____ Date_____

Chairperson, Senate Com. on UG or GR Studies_____ Date_____

Chairperson, Senate Coordinating Com. _____ Date_____

Secretary, Faculty Senate _____ Date_____

Date of Senate Resolution_____ Date to be Effective _____

Registrar _____Program Code _____ Date_____

Vice Provost for Academic Affairs & International Programs_____ Date_____

Provost _____ Date_____

Board of Trustee Notification_____ Date_____

Revised 10/23/2007 /khs