

Proposal for an Undergraduate Minor in Sustainability @ Illinois Tech

To be offered through courses across the Lewis College of Science and Letters, Armour College of Engineering, Stuart School of Business, and College of Computing

Proposal led by:

- Weslyne Ashton, PhD, Associate Professor, Stuart School of Business & Institute of Design
- Britt Burton-Freeman, PhD, Professor and Chair, Food Science and Nutrition
- Matthew Shapiro, PhD, Associate Professor, Social Sciences
- Brent Stephens, PhD, Professor & Chair, Civil, Architectural, and Environmental Engineering

Rationale: As the world faces tremendous challenges and threats to its own sustainability -- including climate change, environmental pollution, depletion of natural resources, loss of biodiversity, poverty, hunger, and gender equality -- the importance of sustainable economic and social development is increasingly prioritized by organizations, governments, and citizens globally. Students target universities that offer coursework in sustainability principles and applications, as well as actionable opportunities both on- and off-campus for putting these ideas into practice.^{1,2} The proposed Undergraduate Minor in Sustainability will allow us to draw on the existing resources and courses offered across several departments at Illinois Tech to meet student demand for programming in this area and provide students with a broad understanding of the principles of sustainability and the tools and techniques used for assessment and mitigation of issues in economic, social, and environmental sustainability. This minor is intentionally broader than, but related to, the existing minor in Energy/Environment/Economics, as it brings together a greater diversity of disciplines and thus focuses on broader aspects and implications of sustainability. Moreover, the proposed Minor in Sustainability sends a clear message to both new and prospective students about our institutional commitment to sustainability in learning and in practice.

Proposed Curriculum:

A total of 15 credits are required to earn the minor. Three *required* courses (9 hours) will introduce students to the social, political, and technical dimensions of sustainability. Two *elective* courses (6 hours) will allow students to focus in sustainability application areas of their choice. The required course list has been curated to have minimal prerequisites and are thus open to a wide variety of students. The curated list of elective courses vary in their prerequisites and thus allow students to take courses that are consistent with their level of preparation in their major degree program.

¹ <https://en.unesco.org/news/most-students-want-sustainable-development-part-all-university-courses-survey-reveals>

² <https://www.usnews.com/education/best-colleges/articles/2019-09-17/why-college-campuses-are-going-green>

Required Courses (9 hours):

- ENVE 201 Earth and Environmental Science
- PS 338 Energy Policy OR PS 329 Environmental Politics and Policy
- FDSN 314 Sustainable Food Systems OR EMS 504 Industrial Ecology

Elective Courses (6 hours):

Select two courses from the list below:

- ARCH 421 Basics of Building Simulation in the Built Environment I
- ARCH 422 Basics of Building Simulation in the Built Environment II
- ARCH 460 Integrated Building Delivery Practice/BIM
- ARCH 462 Planning Law and Land Policy
- CAE 331 Building Science*
- CAE 465 Energy Conservation in Building Design*
- CAE 556 Net Zero Energy Home Design Competition I
- CAE 557 Net Zero Energy Home Design Competition II
- CHE 543 Energy, Environment, and Economics*
- CHEM 410 Science of Climate Change
- ECE 412 Hybrid Electric Vehicle Drives*
- ECE 418 Power Systems Analysis*
- ECE 548 Energy Harvesting*
- ECE 580 Elements of Sustainable Energy*
- EMS 501 Environmental Law
- EMS 503 Environmental Pollution Control
- EMS 504 Industrial Ecology
- EMS 505 Environmental Economics & Finance
- EMS 541 Sustainable Energy Systems
- ENVE 401 Introduction to Water Resources Engineering*
- ENVE 402 Intro to Environmental Engineering and Sustainable Design*
- ENVE 403 Occupational and Environmental Health and Safety
- ENVE 404 Water and Wastewater Engineering*
- ENVE 463 Introduction to Air Pollution Control*
- FDSN 314 Sustainable Food Systems
- FDSN 410 Food Plant Operations
- INTM 416 Integrated Facilities Management
- INTM 423 Sustainable Facilities Operations
- INTM 459 Issues in Industrial Sustainability
- INTM 461 Energy Options for Industry
- INTM 462 Special Topics in Sustainability
- MMAE 522 Nuclear, Fossil-Fuel, and Sustainable Energy Systems*
- MMAE 524 Fundamentals of Combustion*

*Denotes engineering prerequisite courses; check course catalog for specific requirements.

Course Catalog Descriptions for Required Courses:

ENVE 201 Earth and Environmental Science (new course under review)

This course introduces students to the fundamentals of earth and environmental science. Topics include: earth systems science; geologic processes, soils, and minerals; global tectonics and earthquakes; environmental systems and biogeochemical cycles; land resources and agriculture; renewable and nonrenewable energy; water resources and water pollution; air pollution; solid waste; climate alteration and global climate change; and environmental sustainability.

PREREQUISITE(S): CHEM 122 OR 124; LECTURE: 3 LAB: 0 CREDITS: 3

PS 329 Environmental Politics and Policy

Students look at the complexities of making and implementing environmental policy at the local, national, regional, and/or global levels. Emphasis will be placed on the ways that conflict and cooperation among multiple economic, social, and political interests contribute to the successes and failures of environmental policy. Topics for in depth study may include global warming, air and water pollution, depletion of natural resources, biodiversity conservation, environmental communication, and the roles played by international organizations, local and national governments, businesses, and non-governmental organizations.

PREREQUISITE(S): HUM 200-299; LECTURE: 3 LAB: 0 CREDITS: 3

SATISFIES: Communications (C), Social Sciences (S)

PS 338 Energy Policy

This course traces our dependence on fossil fuels and government-based attempts to promote energy conservation and develop alternative energy sources. Assessed are the economic and political effects of the supply and demand for energy; the implications of different energy production and consumption methods; and efforts to minimize the environmental consequences through increased energy efficiency and/or regulation. The course explores such problems as fossil fuel dependence, greenhouse gas emissions reductions, nuclear waste, rapid industrialization, and national and international attempts to provide economic, political, and technological solutions.

PREREQUISITE(S): HUM 200-299; LECTURE: 3 LAB: 0 CREDITS: 3

SATISFIES: Communications (C), Social Sciences (S)

EMS 504 Industrial Ecology

This course introduces students to the emerging field of industrial ecology and examines how this systems-based approach can be used to move society toward a more sustainable future. Industrial ecology is an interdisciplinary field involving technology (science and engineering), public policy, business administration, and, increasingly, the social sciences. The course introduces strategies and tools such as material and energy flow analysis, life cycle assessment, design for the environment, extended producer responsibility, and industrial symbiosis. Both individual assignments and team projects are a significant part of the learning experience in this course.

LECTURE: 3 LAB: 0 CREDITS: 3

FDSN 314 Sustainable Food Systems

This course is designed to give students an appreciation of the complex intersections and relationships among food and culture, economics, the environment, labor, policy, population health, and social justice. Students will have opportunities to work on projects that model and analyze these relationships, and consider trade-offs impacting production and consumption, global nutrition and health, scarcity in resources, and more. Students will visit urban and rural farms, introduced to alternative farming techniques and their challenges, how sustainability is measured and reported in the food and related industries.

LECTURE: 3 LAB: 0 CREDITS: 3