



## Sustainability Graduate Certificate Program Course Requirements

*The Sustainability Certificate program consists of 12 credit hours.*

The Sustainability Graduate Certificate is designed to accommodate the diverse skill sets and disciplinary backgrounds of potential applicants, yet provide sufficient structure to deliver a cohesive learning experience. The certificate requires completion of:

- 6 credits of coursework in fundamental knowledge
- 6 credits of coursework in skill development
- A capstone experience that allows students to apply the knowledge and skills they developed through their coursework. The capstone may take the form of an additional 3-credit course or an approved co-curricular experiential activity.

A list of pre-approved courses designated as either Sustainability Knowledge Fundamentals or Skill Set Development is below.

When applying to the certificate program, students must identify a proposed suite of courses related by a focus area. Alternate courses may be approved given adequate justification. For courses not on the pre-approved list, the program coordinator or designated member(s) of the certificate committee will evaluate and approve course selection. Suggested curricula for example focus areas are given below.

### **Experiential learning capstone experience (3 credit equivalent)**

The capstone experience is an activity or combination of activities that represent the effort associated with a 3-credit course. The capstone experience may be in the form of an approved 3-credit elective course, or an approved activity not associated with an official course. Current non-credit opportunities include participation in the Dow Sustainability Fellows Program, Sustainability Without Borders, Blue Lab, Planet Blue, the Campus Farm, sustainability-related internships, or other approved experiential activity. For example, experiential activities could take the form of an intensive international project trip, volunteering at a community organization over the course of a semester, or helping to design and implement a Planet Blue campaign. Given the range of possible activities, experiential activities that are not taken for course credit are evaluated on a case-by-case basis. The suitability of experiences that also fulfill requirements for a graduate degree, such as a required project, departmental capstone course, or research project, are evaluated on a case-by-case basis. Capstone experiences must have a distinct sustainability-related focus and should be approved in advance of the activity.

### *Advising*

Each student must obtain a faculty advisor for the certificate program who is knowledgeable in the student's proposed focus area. The role of the advisor will be to assist the student in selecting appropriate coursework relevant to the proposed focus area.

Below is a list of pre-approved courses designated by the category of Sustainability Knowledge Fundamentals or Skill Set Development. Students must identify a proposed suite of courses related by some focus area in their application to the certificate. Alternate courses may be approved given adequate justification.

### **SUSTAINABILITY KNOWLEDGE FUNDAMENTALS (6 CREDITS REQUIRED)**

This set of courses allows students to acquire fundamental knowledge in sustainability principles. Courses that fulfill this requirement focus on foundational theory and background within a specific topic, providing context and in-depth analysis of that topic. Included are courses that cover principles of sustainability, ethics, behavior, education, biodiversity conservation, policy, law, or other sustainability-themed courses that investigate a particular topical area through case studies. Choose 6 credits from the following:

- ANTHRCUL 539: Consumption (3 credits)
- ANTHRCUL 625: Anthropological Approaches to Property and Property Rights (3 credits)
- POLSCI 650: Political Economy of Development (3 credits)
- EHS 588: Environmental Law (3 credits)
- EHS 574/CHEM 574: Environmental Chemistry (3 credits)
- EPID 666: Health and Socioeconomic Development (3 credits)
- HBEHED 516: Global Health: Anthropological Perspectives (3 credits)
- LAW 771: How to Save the Planet (3 credits)
- EAS 537: Urban Sustainability (3 credits)
- EAS 528: Foundations of Sustainable Food Systems (3 credits)
- EAS 501.055: Poverty, Environment, and Inequality (3 credits)
- EAS 501.089: Justice Issues in Conservation and Sustainability (3 credits)
- EAS 501.162: Sustainability for Development (3 credits)
- EAS 520: Fluvial Ecosystems (3 credits)
- EAS 577: Political Ecology, Environmental Security and Conflict (3 credits)
- EAS 509: Ecology: Science of Context and Interaction (4 credits)
- EAS 510: The Science and Practice of Social Change (3 credits)
- EAS 536/BL 536: Ethics of Corporate Management (2.25 credits)
- EAS 517: Conservation Biology (3 credits)
- EAS 555: Climate and Development (3 credits)
- EAS 557/CEE 586: Industrial Ecology (3 credits)
- EAS 560/URP 543/SW 710: Behavior and Environment (3 credits)
- EAS 564: Localization (3 credits)
- EAS 565: Principles of Transition (1.5 credits)
- EAS 566: Public Opinion and the Environment (3 credits)
- EAS 574/PUBPOL 519: Sustainable Energy Systems (3 credits)
- EAS 593: Environmental Justice (3 credits)
- EAS 592/URP 542: Environmental Planning: Issues and Concepts (3 credits)
  
- EAS 596/AAS 596: History of Environmental Thought and Activism (3 credits)
- URP 553: Sustainable Urbanism and Architecture (3 credits)

### **SKILL SET DEVELOPMENT (SIX CREDITS REQUIRED)**

This set of courses allows students to acquire specific tools and methods that can be applied to the practice of sustainability. Courses fulfilling this requirement focus on developing techniques and tools of analysis, intervention or design principles, and generally have associated problem sets, laboratory or field-based components, design projects, mock negotiations, or other experiences directly related to skill development. Included are courses related to modeling, mapping, design, policy-making, behavior change, analytical problem solving, and otherwise acquiring experience applying different tools or techniques. Choose 6 credits from the following:

- ARCH 575: Building Ecology (3 credits)
- CEE 460: Design of Environmental Engineering Systems (3 credits)
- CEE 582: Environmental Microbiology (3 credits)
- CEE 686/CHE 686: Case Studies in Environmental Sustainability (2-3 credits)
- COMPLEXSYS 501: An Introduction to Complex Systems (3 credits)
- CEE 520: Land-Surface Hydrology (3 credits)
- EEB 556: Field Botany of Northern Michigan (UMBS)
- EEB 585: Ecology of Streams and Rivers (UMBS)
- ECON 662: Environmental Economics (3 credits)
- EHS 570: Water Quality Management (3 credits)
- EHS 672: Life Cycle Assessment: Human Health and Environmental Impacts (3 credits)
- ENGR 521: CleanTech Entrepreneurship (3 credits)
- FIN 583: Energy Project Finance (1.5 credits)
- FIN 637: Finance and Sustainable Enterprises (2.25 credits)
- MECHENG 589: Sustainable Design of Technology Systems (3 credits)
- EAS 447: Forest Ecology and Management (4 credits)
- EAS 549: Analysis and Modeling of Ecological Data (3 credits)
- EAS 554: Urban Agriculture (3 credits)
- EAS 573: Environmental Footprinting and Input-Output Analysis (3 credits)
- EAS 578: Urban Storm water: Science, Design, and Management (3 credits)
- EAS 501.046: Science and Management of the Great Lakes (3 credits)
- EAS 501.162: Sustainability for Development (3 credits)
- EAS 552: Ecosystem Services (3 credits)
- EAS 545: Applied Ecosystem Modeling (2 credits)
- EAS 610: Advanced LCA Methods and Software Tools (1.5 credits)
- EAS 512/STRAT 564: Strategies for Sustainable Development I
- EAS 513/Strategy 565: Strategies for Sustainable Development II
- EAS 572/EHS 572: Environmental Impact Assessment (2 credits)
- EAS 520: Fluvial Ecosystems (3 credits)
- EAS 521: Fluvial Ecosystems Lab (1 credit)
- EAS 523: Environmental Risk Assessment (2 credits)
- EAS 527/BE 527: Energy Markets and Energy Politics (3 credits)
- EAS 531: Principles of GIS (4 credits)
- EAS 533: Negotiation Skills in Environmental Dispute Resolution (3 credits)
- EAS 534: GIS and Landscape Modeling (3 credits)
- EAS 540: GIS for Natural Resource Applications (2 credits)
- EAS 541: Remote Sensing (4 credits)
- EAS 543: Environmental Spatial Data Analysis (3 credits)
- EAS 550/STRAT 566: Systems Thinking for Sustainable Development (3 credits)

- EAS 556/EEB 477: Field Ecology (5 credits)
- EAS 561: Psychology of Environmental Stewardship (3 credits)
- EAS 562: Environmental Policy, Politics, and Organizations (3 credits)
- EAS 563: International Environmental Policy (3 credits)
- EAS 568: Re-Connecting and Re-Vitalizing (1.5 credits)
- EAS 570: Environmental Economics: Quantitative Methods and Tools (3 credits)
- EAS 581: Advanced Education for Environment and Sustainability(3 credits)
- EAS 589: Ecological Restoration (4 credits)
- EAS 592/URP 542: Environmental Planning: Issues and Concepts (3 credits)
- EAS 597: Environmental Systems Analysis (3 credits)
- EAS 605/BA 605: Green Development (3 credits)
- EAS 639.108: Conservation Biology and Ecosystem Health (1 credit)
- EAS 664: Food and Fuel: Research Questions at the Base of the Economy (1.5-2 credits)
- EAS 687: Landscape Planning (4 credits)
- EHS 570: Water Quality Management (3 credits)
- EHS 633: Evaluation of Global Nutrition Programs (3 credits)
- URP 540: Land use and Development Management Planning
- URP 528: Food Systems Planning (3 credits)
- URP 532: Sustainable Development (3 credits)
- URP 542: Environmental planning: Issues and concepts (3 credits)
- URP 553: Sustainable urbanism and architecture (3 credits)
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### **EXPERIENTIAL LEARNING CAPSTONE EXPERIENCE (THREE CREDITS REQUIRED)**

The capstone experience is an activity or combination of activities that represent the effort associated with a 3-credit course. The capstone experience may be in the form of an approved 3-credit elective course, or an approved activity not associated with an official course. Current non-credit opportunities include participation in:

- the Dow Sustainability Fellows Program
- Sustainability Without Borders
- Blue Lab

- Planet Blue
- the Campus Farm
- Sustainability related internships
- Other approved experiential activity

For example, experiential activities could take the form of an intensive international project trip, volunteering at a community organization over the course of a semester, or helping to design and implement a Planet Blue campaign. Given the range of possible activities, experiential activities that are not taken for course credit are evaluated on a case-by-case basis. The suitability of experiences that also fulfill requirements for a graduate degree, such as a required project, departmental capstone course, or research project, are evaluated on a case-by-case basis. Capstone experiences must have a distinct sustainability-related focus and should be approved in advance of the activity.

*Advising: each student must obtain a faculty advisor for the certificate program who is knowledgeable in the student's proposed focus area. The role of the advisor will be to assist the student in selecting appropriate coursework relevant to the proposed focus area.*

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## EXAMPLE CURRICULA FOR FOCUS AREAS

Students are free to design their own focus area, with approval from the certificate coordinator or committee member designated by the coordinator. To provide some structure, this pre-approved list of focus area coursework is given; however, students are not required to choose from the areas listed. Similar to the course lists, the pre-approved focus areas will undergo an annual review by the certificate committee. It is expected that the pre-approved focus areas will change over time. Example pre-approved focus areas include:

### 1. SUSTAINABLE FOOD SYSTEMS

#### A. Sustainability knowledge fundamentals (6 credits required)

- EAS 528 Foundations of a sustainable food systems (3 credits) Plus

one of the following:

- EEB 498: Ecology of Agroecosystems (3 credits)
- EAS 501 (055): Food Systems: Implications of Unequal Access (4 credits)

#### B. Skill set development (6 credits required)

- URP 528: Food systems planning (3 credits)
- EHS 633: Evaluation of Global Nutrition Programs (3 credits)

#### C. Experiential learning capstone experience (3-credit equivalent)

Internship with any of the following:

- UM Sustainable Food Systems Campus Farm
- Washtenaw Food Policy Council
- Washtenaw Food Hub
- Growing Hope

### 2. TRANSITIONAL THINKING FOR A SUSTAINABLE SOCIETY

**A. Sustainability knowledge fundamentals** (6 credits required)

- EAS 564: Localization (1.5 credits)
- EAS 565a: Principles of transition (1.5 credits)
- EAS 565b : Power-over and power-with (1.5 credits)
- EAS 560: Behavior and environment (3 credits)

**B. Skill set development** (6 credits required)

- EAS 561: Psychology of environmental stewardship (3 credits)
- EAS 568: Re-connecting and re-vitalizing (1.5 credits)
- EAS 581: Advanced Education for Environment and Sustainability (3 credits)

**C. Experiential learning capstone experience** (3 credit equivalent)

Internship with any of the following:

- Sustainability Without Borders
- Washtenaw Food Policy Council
- Data-Driven Detroit

**3. SUSTAINABLE CITIES**

**A. Sustainability knowledge fundamentals** (6 credits required)

- URP 542: Environmental planning: Issues and concepts (3 credits)
- URP 553: Sustainable urbanism and architecture (3 credits)

**B. Skill set development** (6 credits required)

- URP 532: Sustainable development (3 credits)
- EAS 605/ARCH 507: Green development (3 credits)

**C. Experiential learning capstone experience** (3 credit equivalent)

Internship with any of the following in an environmental capacity:

- City of Ann Arbor
- Washtenaw County

**4. SUSTAINABILITY POLICY**

**A. Sustainability knowledge fundamentals** (6 credits required)

- EAS 510: The Science and Practice of Social Change (3 credits)
- EAS 566: Public opinion and the environment (3 credits)

**B. Skill set development** (6 credits required)

- EAS 562: Environmental policy, politics and organizations (3 credits)
- EAS 563: International environmental policy (3 credits)

**C. Experiential learning capstone experience** (3 credit equivalent)

Internship with:

- National or international environmental NGO focused on policy making

**5. SUSTAINABLE ENERGY**

**A. Sustainability knowledge fundamentals** (6 credits required)

- EAS 557, CEE 586: Industrial ecology (3 credits)

**B. Skill set development** (6 credits required)

- EAS 527, BE 527: Energy markets and energy politics (3 credits)

**C. Experiential learning capstone experience** (3 credit equivalent)

Internship with one of the following:

- National or international environmental NGO focused on energy issues

- Energy-related enterprise
- Local, regional or national agency focused on energy issues

## 6. SUSTAINABLE MANAGEMENT OF BIOLOGICAL RESOURCES

### A. Sustainability knowledge fundamentals (6 credits required)

- EAS 517: Conservation Biology (3 credits)
- EAS 589: Ecological Restoration (4 credits)

### B. Skill set development (6 credits required)

- EAS 556: Field Ecology (5 credits)

Plus one ecosystem or organismal class, such as:

- EAS 447: Forest Ecology and Management (4 credits)

### C. Experiential learning capstone experience (3 credit equivalent) Internship

with one of the following:

- SEAS Affiliated Research Center
- Local, national or international NGO focused on biodiversity and conservation (e.g., The Nature Conservancy, The Sierra Club, World Wildlife Federation)
- Local, regional, or national agency focused on conservation (e.g., Michigan Department of Natural Resources, U.S. Fish & Wildlife Service)

## 7. SUSTAINABLE WATER SYSTEMS

### A. Sustainability knowledge fundamentals (6 credits required)

- EAS 520: Fluvial Ecosystems (3 credits)
- CEE 520: Land-Surface Hydrology (3 credits)

### B. Skill set development (6 credits required)

- EHS 570: Water Quality Management (3 credits)

### C. Experiential learning capstone experience (3 credit equivalent) Internship

with one of the following:

- SEAS Affiliated Research Center focused on water-related issues
- (e.g., Cooperative Institute for Limnology & Ecosystems Research – CILER; Michigan Sea Grant, or Great Lakes Environmental Research Lab - GLERL).
- Local, national or international NGO focused on water quality and management
- (e.g., Huron River Watershed Council, Michigan Clean Water Action)
- Local, regional or national agency focused on water quality and management (e.g., Michigan DEQ, U.S. Geological Survey)