

Environmental Conservation Graduate Program: Sustainable Building Systems Concentration

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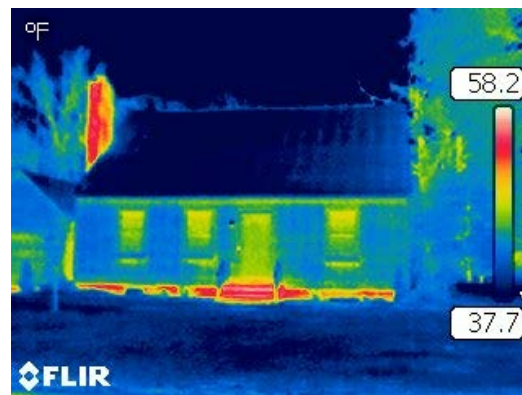
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A. Concentration Description

The Sustainable Building Systems concentration leads to a professional (coursework-only) Master of Science (MS), a thesis-based Master of Science (MS), and a Doctor of Philosophy (PhD) degree in Environmental Conservation (ECo). It has been designed for students who want scientific training in the multi-disciplinary field of sustainable building systems and the built environment.

The focus of this concentration is broadly on green building and sustainable building systems but encompasses specialized training in fields such as:

- Sustainability in the built environment
- Green building practices and policies
- Sustainable building materials
- Structural timber systems
- Computational material modeling
- Building energy systems and efficient design
- Clean energy solutions for buildings
- Building evaluation and retrofitting
- 3D design and Building Information Modeling (BIM)
- Construction project management
- Management/marketing of building materials



Sustainable Building Systems students often conduct studies on environmentally sensitive building materials and energy systems.

The diverse nature of the concentration is intended to allow students from different backgrounds to shape their own education under the guidance of expert faculty supervisors.

Faculty affiliated with this concentration (as listed below) have expertise in environmentally sensitive building materials & systems (green building); bio-based composite mechanics; timber engineering and design; computer applications in building design; building energy modeling and systems design; clean energy; building evaluation and efficiency retrofitting; sustainable construction management; and 3D CAD and BIM.

A major strength of our program is the unique interdisciplinary linkage of both faculty and students to related departments and programs of building on campus. Sustainable building systems faculty in BCT also serve as adjunct faculty in Architecture, Civil and Environmental Engineering, and other departments. Our location in the Olver Design Building also provides us with proximity to the Departments of Architecture as well as Landscape Architecture and Regional Planning (LARP), two academic units whose work also centers on the built environment.

Our interdisciplinary culture supports joint instruction and learning, and provides a holistic education, including life-cycle considerations of building systems, giving graduates of the program a key hiring advantage. Students and faculty with backgrounds in material science, planning, architecture and engineering share research projects, labs and valuable expertise.

At the MS level, students have the option of pursuing either a professional degree or thesis degree. The MS *thesis* degree centers on the completion of a major independent research project in addition to a modest preparatory coursework requirement. The MS *professional* degree centers on an expanded curriculum of substantial, graduate coursework. Both degree options provide students a strong foundation in three core topic areas:

- 1) **Building Systems** (ECo equivalent program category: Environmental Science)
- 2) **Sustainable Building Science** (ECo equivalent program category: Quantitative Science)
- 3) **Sustainable Building Projects and Policy** (ECo equivalent program category: Human Dimensions)

The MS *thesis* degree is intended to prepare students for the option of pursuing a PhD and an eventual career (academic or professional) in building science and systems. The MS *professional* degree is meant to be a terminal degree for students seeking graduate-level training in our particular field of study and a career as a professional in the many fields that focus on the built environment. Overall, the academic requirements of this concentration (through coursework and/or a research-based thesis) provide students the professional training for sustainable building positions within academia, non-governmental organizations, and private industry (e.g., building design consulting firms). In addition, MS *thesis* degree students completing this program are well prepared to meet the challenges of any PhD program. Both MS options are designed to be completed in approximately 1-2 years.

The doctoral degree (PhD) in the Sustainable Building Systems concentration has a strong focus on an independent, advanced, and innovative dissertation research topic. Course requirements are set mainly by the advisory committee. This degree usually takes 4-5 years to

complete.

Research projects of current and past graduate students in the Sustainable Building Systems Concentration are varied, ranging from testing and computational modeling of structural composite materials to energy auditing and building diagnostics to forest products economics. Through their research projects, graduate students often employ or provide volunteer opportunities for interested undergraduates (over 240 in the Building and Construction Technology program alone). Graduate students are also encouraged to participate in projects and activities of their colleagues to broaden their experience and to provide and receive ideas and suggestions for improvements.



Sustainable Building Systems students often conduct studies on structural timber systems.

B. The MS Professional Degree

Prerequisites

Candidates for an MS professional degree in this concentration will be admitted on the basis of their academic training, work experience, statement of intent and letters of recommendation. At a minimum, candidates will be expected to possess:

- 1) A Bachelor's degree in one of these fields:
 - a) a related engineering discipline (e.g., structural, mechanical)
 - b) architecture or urban studies
 - c) a technical degree with a focus on building science, building technology, planning or construction
 - d) construction management/science
 - e) business administration with an emphasis in real estate or construction
 - f) any field with a strong background in the physical or environmental sciences and professional experience working as a building professional.
- 2) a minimum GPA of 3.0 in previous education (or minimum 4 years related work experience and high GREs)

Note: prerequisites exist for many of the required courses. Students are expected to have satisfied these prerequisites prior to commencing the program or in addition to the curriculum requirements outlined below.

Requirements

Students in this concentration are expected to meet all of the requirements for an MS degree as outlined in the UMass Graduate School requirements, including the following:

- 1) A minimum of 30 credits is required: 2 of which will be BCT590S, Sustainable Building Systems & Construction Technology (1 credit each semester). The remaining 28 credits are to be specific to this concentration and approved by the student's advisory committee; 12 of which must be at the 600 level or above.
- 2) Up to six of the 12 minimum 600 level credits may be an internship/practicum (ECO 698).
- 3) Up to 6 credits can be transferred from previous course work from UMass or another university subject to approval of the Graduate School.
- 4) Successful completion of all course work, while maintaining a good academic record during professional master's studies.
- 5) The student's grade-point average must be at least 3.0.
- 6) Successful completion of an Exit Interview based upon the student's academic training, with the format and extent determined by the students' faculty advisors.

Curriculum

See [BCT Graduate Studies website](https://bct.eco.umass.edu/academics/graduate-studies-sustainable-building-systems/course-listing/) for a complete and up-to-date course listing.

Link: <https://bct.eco.umass.edu/academics/graduate-studies-sustainable-building-systems/course-listing/>

1. Required Core Courses (2 credits; 1 credit each semester):

- BCT 590S - Topics in Sustainable Building Systems and Construction Technology (Fall & Spring – Prof. Fiocchi, 1 credit each semester)

2. Core Topic Areas (min. 28 credits) including:

- 22 of which must be in the major (defined broadly)
- 6 of which must be at the 600 level or above

3. Practicum (6 credits; optional):

- An internship/ practicum specific to the student's concentration and approved by the Professional Master's Faculty Advisor. These credits would serve as 6 credits of the required total.

4 Exit Interview:

- Successful completion of an exit interview based upon the student's academic training in the student's area of concentration.

Note: Students may take courses other than those listed to fulfill the core topic area

requirements as long as they are approved by the Professional Master's Chief Advisor.

C. The MS Thesis Degree

Prerequisites

Candidates for an MS thesis degree in this concentration will be admitted on the basis of their academic training, work experience, letter of intent and letters of recommendation. At a minimum, candidates will be expected to possess:

- 1) A Bachelor's degree in one of these fields:
 - a) a related engineering discipline (e.g., structural, mechanical)
 - b) architecture or urban studies
 - c) a technical degree with a focus on building science, building technology, planning or construction
 - d) construction management/science
 - e) business administration with an emphasis in real estate or construction
 - f) any field with a strong background in the physical or environmental sciences and professional experience working as a building professional.
- 2) a minimum GPA of 3.2 in previous education (or minimum 4 years related work experience and high GREs)

Note: prerequisites exist for many of the required courses. Students are expected to have satisfied these prerequisites prior to commencing the program or in addition to the curriculum requirements outlined below.

Requirements

Students in this concentration are expected to meet all of the requirements for an MS thesis degree in ECo, as outlined in the Environmental Conservation student handbook, including the following:

- 1) A minimum of 30 credits are required, 21 of which must be in the major field (defined broadly), 6 of which must be at the 600 level or above, and 6 of which must be a thesis [699] specific to this concentration and approved by the student's advisory committee.
- 2) Up to 6 credits can be transferred from previous course work from UMass or another university subject to approval of the Graduate School.
- 3) Successful completion of a comprehensive evaluation based upon the student's academic training, with the format and extent determined by the students' faculty advisors;
- 4) Successful final defense of the thesis; and
- 5) A minimum of one publishable-quality scientific paper resulting from the thesis research project (with a draft submitted to the advisory committee at the time of graduation).

Curriculum

See [BCT Graduate Studies website](https://bct.eco.umass.edu/academics/graduate-studies-sustainable-building-systems/course-listing/) for a complete and up-to-date course listing.

Link: <https://bct.eco.umass.edu/academics/graduate-studies-sustainable-building-systems/course-listing/>

1. Required Core Courses (8 credits) (take all of the following)

BCT 590S – Topics in Sustainable Building Systems and Construction Technology (Fall & Spring – Prof. Fiocchi, 1cr) or ECO 691A – Departmental Seminar (1 cr) (both are mandatory for two semesters (2cr total)

ECO 601 – Research Concepts (3cr)

ECO 602 – Analysis of Environmental Data (3cr) (or alternative approved by the students' faculty advisors)

2. Core Topic Areas (16 credits) including:

- a minimum of one 500-level or above 3-4 credit course in each of the three core topic areas, as approved by the students advisory committee.

Note: Students may take courses other than those listed here to fulfill the core topic area requirements if they are approved by the student's advisory committee and the Graduate Concentration Coordinator).

3. Thesis (6 credits)

ECO 699 – Thesis

D. The PhD Degree

Prerequisites

Candidates for a PhD degree in this concentration will be admitted on the basis of their academic training, work experience, and letters of recommendation. At a minimum, candidates will be expected to possess:

- 1) A Bachelor's degree in one of these fields:
 - a) a related engineering discipline (e.g., structural, mechanical)
 - b) architecture or urban studies
 - c) a technical degree with a focus on building science, building technology, planning or construction
 - d) construction management/science
 - e) business administration with an emphasis in real estate or construction
 - f) any field with a strong background in the physical or environmental sciences and professional experience working as a building professional.
- 2) a minimum GPA of 3.2 in previous education (or minimum 4 years related work experience and high GREs)

*Note, students wishing to pursue a PhD with only a BS degree can choose to obtain a MS degree along the way toward completion of Ph.D. degree requirements. MS is not a requirement.

Requirements

Students in this concentration are expected to meet all of the requirements for a PhD degree in ECo, as outlined in the Environmental Conservation student handbook, including the following:

- 1) A minimum of 10 dissertation credits are required, based on a research project specific to this concentration and approved by the student's advisory committee; no other course credits are required other than those determined by the student's advisory committee;
- 2) Complete two consecutive, full time semester residency
- 3) Successful completion of a comprehensive exam based upon the student's academic training in environmental conservation, encompassing all three "core" topic areas (See [BCT Graduate Studies website](#) for a complete and up-to-date course listing. Link: <https://bct.eco.umass.edu/academics/graduate-studies-sustainable-building-systems/course-listing/> ;
- 4) Successful final defense of the dissertation; and
- 5) A minimum of three publishable-quality scientific papers resulting from the dissertation research project (with at least one submitted for publication by the time of graduation).

E. Resources & Facilities



Graduate students have access to three interdisciplinary teaching and research laboratories that serve the Building and Construction Technology (BCT) program:

- **Wood Mechanics Laboratory** – A high-head, mechanics testing lab where we fabricate and test structural components and building materials (see <https://bct.eco.umass.edu/research/facilities/wood-mechanics-lab/> for details).
- **Building Science Laboratory** – A flexible lab for building science and building energy use and performance investigations (see <https://bct.eco.umass.edu/research/facilities/building-science-lab/> for details).
- **Trimble Technology Lab** – A software- and advanced surveying equipment-based technology lab, established through a gift from Trimble (see <https://bct.eco.umass.edu/research/facilities/trimble-technology-lab/> for details).

Our laboratories house state-of-the-art equipment for structural material testing, building energy diagnostics and modeling, and building surveying and metrology.

The Design Building houses two **computing laboratories**. All lab computers and most of the campus' IT classroom computers have discipline-relevant software installed (CAD/BIM, structural design, estimating, energy modeling etc.). In addition to the resources available through the central **UMass library system**, we also maintain current collections of field-relevant peer-reviewed scientific and trade journals, texts and research proceedings. Other resources in the Design Building include a **wood shop** and **digital fabrication center**, which we share with the other departments in the Design Building (Architecture as well as Landscape Architecture and Regional Planning). Through our home Department of Environmental Conservation, we also have access to resources in **Holdsworth Hall**. For more on the ECO labs, visit the ECO web site (<http://eco.umass.edu>).

Industry contract work is also common for which students are often integrally involved.

Companies draw on the expertise of the faculty and students to serve as consultants for various research enquiries.

F. Matriculation & Financial Aid

Our graduate program typically takes a full-time MS *professional* degree student 2-4 semesters to complete, a full-time MS *thesis* degree student 4-5 semesters to complete, and a full-time PhD student 8-10 semesters to complete, including all respective requirements. However, some students may be able to complete the degree in less time and some take longer depending on their academic preparedness and the dictates of the thesis/dissertation research project as well as funding availability.

Funding opportunities are limited, yet we strive to provide financial assistance to virtually all of our MS *thesis* and PhD students through teaching or research assistantships (at Graduate Employee Organization bargained wage rates), university fellowships, or hourly wages. The university waives tuition during semesters in which at least a 10-hour assistantship or fellowship is awarded, but the student remains responsible for most fees. Research assistantships are available through faculty members who have grant-supported research, and many faculty only accept thesis/dissertation students if they are able to provide grant-supported assistantships. Limited university fellowships are awarded by the Graduate School in open competition for students (including foreign applicants) who are endorsed by the Department. Outside support may also be available, see this page for more information: <https://bct.eco.umass.edu/academics/financial-aid/>.

We typically do not provide funding opportunities for students in the MS *professional* degree option. Some teaching assistantships and university fellowships may be available, or internship institutions may be able to provide some assistance, but professional degree students are typically self-funded. As is university policy, tuition is waived during semesters in which at least a 10-hour assistantship or fellowship is awarded (or the equivalent from an internship employer), but the student is responsible for most fees. Such arrangements can affect the time to graduation, however, because funding necessarily requires a certain time commitment.

G. Concentration Coordinator & Faculty Affiliates

The following on-campus faculty (both regular and adjuncts), including the Graduate Concentration Coordinator and Professional Master's Chief Advisor, are principally affiliated with this concentration and regularly serve in the role of the student's advisory committee chair or member and instructor for core courses; other faculty are occasionally involved in this concentration. See the BCT program website for information about the faculty (<https://bct.eco.umass.edu/people/faculty/>) and the ECo graduate program website for more information on the its requirements (<http://eco.umass.edu/degree-programs/graduate-programs/>).

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See also: <https://bct.eco.umass.edu/people/faculty/>