BCT Courses Offered by BCT for Professional Master's Degree

**BCT 520 – Energy and Buildings**

*Fall – Prof. Fiocchi – On Moodle*

An introduction to building energy use focusing on the minimization of energy costs and dependence on non-renewable fossil fuel sources through the implementation both time honored passive design strategies and effective building envelope construction practices. The course also introduces students to the fundamentals of building system loads and building annual energy consumption calculations providing the necessary metricized evaluation of a building’s energy and associated climate impacts in relation to other buildings of similar types and program in similar climates.

This is a seminar course that will rely on a combination of lecture, reading materials, and a field trip exploring the methods and materials necessary to reduce a building’s environmental impact.

**BCT 521 – Environmental Control Systems and Lab (4 cr.)**

*Spring – Prof. Fiocchi – On Moodle*

This course is intended for those who wish to learn about building energy and environmental systems from both a traditional and a sustainable design perspective. Students will be introduced to the basics of HVAC (heating, ventilation, and air conditioning) systems. Through a combination of lecture, reading materials, guest lectures, and field trips they will analyze the heating and cooling loads of commercial buildings and learn how to introduce these systems into existing buildings and design these systems for high performance building.

The lab component for this class introduces students to technical and non-technical aspects of whole building energy simulation during building design, retrofitting and maintenance. Students will learn to use a state-of-the-art building energy modeling tool, eQUEST (available for free from Department of Energy) to calculate and optimize whole building energy loads. The goal is to explore key design decisions such as building orientation and form along with system choices to calculate heating and cooling loads through modeling and simulation. You must have access to a laptop for the lab.

Prerequisites: BCT 520
BCT 525 – Solar Energy Systems & Building Design

Fall – Prof. Kim

Introduces the fundamental concepts of solar building design and energy systems. Through project-based study and occasional field visits, students will explore the theory, technologies, applications, and benefits of solar design of buildings and discover how to utilize solar energy systems for residential and commercial buildings.

Students will be required to research and document technology and complete a semester case study project in which they will examine various energy conservation aspects and economics underlying solar energy systems.

BCT 530 – Mechanics of Building Materials for Construction (3cr.) & BCT 597BM – Problem Solving in Building Mechanics (1 cr.)

Spring – Prof. Clouston – Website

Introduces students to the mechanical behavior of engineered wood products and wood composites as contemporary structural building materials. Basic structural concepts including statics and strength of materials are addressed in a practical, hands-on manner. An overview of the relative merits of common structural wood products is provided. Practical applications of wood-based materials are highlighted throughout the course through in-class examples and illustrations, homework assignments and lab tutorials.

BCT 540 – Design of Wood Structures

Fall – Prof. Clouston – Website

Provides students with a fundamental understanding of structural engineering wood design principles. Focus is placed on design procedures – as well as underlying assumptions therefor – for wood members in residential, commercial and industrial applications. Through class examples and assignments, students will learn design techniques for individual wood components including: beams, columns, trusses, wood/steel connections, and diaphragms using both conventional lumber products and state-of-the-art engineered wood products.

Pre-requisite: BCT 530
BCT 550 – Construction Project Management

*Fall / Spring – Prof. Ewart*

This class introduces the fundamental concepts of project management for sustainable design and construction and is suitable for students in various disciplines, particularly architecture, engineering, construction, information technology and management. Topics to be discussed include project initiation, integrative planning, implementation, monitoring, control and closeout; effective goal setting, documentation, scope/quality, budget and schedule definition; team organization, contracts and negotiation, risk management, legal, environmental and other issues throughout the project life cycle.

BCT 590S – Topics in Sustainable Building Systems and Construction Technology (1 cr.)

*Fall / Spring – Prof. Fiocchi*

The course serves as a dynamic sampling of the multiple disciplines necessary to create or modify the Built Environment. Lectures presented by various educators, researchers, and practitioners; experts in their fields will provide students with a broadened perspective, which will help foster critical thinking and provide a more expansive view of the Built Environment.

Required for all graduate students, every semester

BCT 597B – Bio-Based Building Lab

*Alternate years – Prof. Clouston*

Students will invent, design, build and structurally test their own laminated and/or cast composites made from natural materials. Classes will entail some instruction (around 4 or 5 lectures) but will depend largely on student participation: making and breaking specimens and reviewing, discussing and presenting class topics. Grades will be based largely on participation as well as a poster and technical report to be submitted at the end. While learning about exciting and new natural composite materials (like Laminated Veneer Bamboo and Cross Laminated Timber), this course is a great resume builder and a fun introduction to materials research and technical communication.
BCT 597F – Wood Design Studio (1 cr.)

Spring – Prof. Clouston

Wood Design Studio provides an opportunity for students to create, design, build and structurally test wood structures. Classes will entail some instruction (around 4 or 5 lectures) and will depend largely on student participation: making and breaking components in the lab and participating in the construction of a timber grid shell while working together as an interdisciplinary team. Grades will be based largely on participation as well as a poster to be submitted at the end. While learning about exciting and new natural composite materials like Cross Laminated Timber, this course is a great resume builder!

BCT 597M – High Performance Building Construction

Fall – Prof. Fiocchi

This course explores the integrated process and applications essential for delivering a High-Performance Green Building. Covering all phases of a building’s life: concept, design, construction, and operation. Through instructor presentations, case studies, field trips, and guest lectures the course will integrate previous experiences and knowledge of traditional code based construction into an expertise relating to the high performance/green building delivery process in both the residential and commercial sectors.

BCT 597R – Clean Energy Corps

Spring / Alternate Years – Prof. Weil

Students in the UMass Clean Energy Corps will work in teams with energy engineers and other staff of the UMass Clean Energy Extension to provide energy analysis and high-level energy audits to Massachusetts cities and towns. We will collect and analyze municipal energy data, conduct walk through and instrumented energy audits on site for some facilities, and provide guidance to help municipalities cut their energy consumption by at least 20%. Students will learn a variety of data analysis and building diagnostic techniques as well as gain experience working with municipal clients.
BCT 597S – Building a Formalized Plan for your “Green” Positioning (1 cr.)

Spring – Prof. Bean

This class builds upon the student’s current technical and/or market knowledge of the “green” space by introducing and demonstrating simple concepts in strategic and tactical planning that can transform their concepts and ideas for “green” business initiatives into definitive actions and results. The techniques presented will help the student develop, articulate and execute a “green” strategy and a transition to “green” both internally, through a change in culture, and externally through a change in market positioning. The course would also benefit those who want to learn the basics of formalized planning for any application as a keystone for future career development or for application in a future “green” business transition.

Each student (or group of students) will be asked to identify a “green” initiative where a formalized business plan would help drive successful execution. The deliverable of the course is a written plan framework to achieve the vision for that initiative. The plan will include a Vision, Mission, 3-5 Objectives, Strategies for each Objective, a sample Action Plan and Metrics to measure progress toward results. The student will also learn a simple proven approach to communicating their plan to achieve the stated vision in a team environment.

BCT 597U – Fundamental Construction Scheduling

Spring – Staff

This class aims to provide students fundamental knowledge for construction planning and scheduling. In the class, students learn to identify work item by using Work Breakdown Structure (WBS), study work logistic sequence, and learn to apply the Critical Path Method (CPM) to construction projects, using precedence diagram networks. To practice the planning and scheduling knowledge, students direct an entire project from planning through scheduling and control, both manually and through software.

BCT 597V – Safety in Construction

Spring – Prof. Steele / Prof. Kauffman

With construction being one of the most dangerous occupations, workplace safety is crucial for every successful building project. This course teaches basic safety concepts through guest lectures and the self-guided study of OSHA principles. Students acquire the 10-hour OSHA safety training (and card) as part of this course (at a small, additional cost), which is the basic requirement for any work on construction sites.
Independent Studies in BCT (BCT 596 or ECO 696)

*On demand – Any faculty – Up to 6 credits*

Independent studies are faculty-guided academic projects. They can be initiated either by faculty or a student and can comprise of research or other academic work. Contact a faculty advisor if you are interested in pursuing this.

Practica in BCT (BCT 598 or ECO 698)

*On demand – Any faculty – 6 credits*

Practica are work-related placements. Contact a faculty advisor if you are interested in pursuing this.

ARCH 653 – Tectonics 3

*Fall – Prof. Schreyer – Website – Syllabus*

This course explores the interrelations between building functions, loads, structural system, materials and construction methods. Topics addressed are structural building layout, design, structural detailing, and documentation of predominantly large-scale buildings and other structures made of steel, concrete, engineered wood and masonry.

Students will be exposed to a wide range of topics centered around structural systems and will be encouraged to develop an integrated approach to planning that considers efficient and appropriate structural solutions. Concept-based design projects and assignments will provide an opportunity to practice this approach.

Emphasis is placed in this course on development of efficient structural form, conceptual and preliminary structural design (using software and approximate calculation methods), integrated design and structural detailing.

ECO 697DL – Sustainable Building & LEED Certification

*Spring – Prof. Kim*

The LEED Professional Credentials indicate professional excellence and a strong depth of knowledge as well as practical understanding of the LEED Rating Systems and how they apply to the high-performance design and construction of the built environment. Preparing to take the LEED Green Associate and AP exams requires more than taking one course; it is a process that involves acquisition of disciplinary knowledge and understanding of complex building and environmental systems. This course introduces core concepts of the USGBC LEED Rating Systems and assists students in study and preparation for the LEED Green Associate exam.
This course provides graduate students with an opportunity to deepen their studies in Building Information Modeling (BIM). In addition to learning about concepts from BCT 420 (enhanced 3D modeling skills and an introduction into Autodesk Revit), students in ECO 697SB must independently research various BIM-related topics, present and implement them. Students are required to complete an in-depth final project in which they explore advanced BIM topics like building energy modeling, estimating and scheduling, parametric modeling and the like.

Pre-requisite: Basic CAD experience (e.g. from BCT 320).