

The logo for Living Routes features the word "Living" in a bold, sans-serif font above a stylized, wavy line representing a path or river. Below this line is the word "Routes" in the same bold, sans-serif font. The entire logo is enclosed in a thin, double-lined rectangular border.

**Living  
Routes**

Study Abroad in Ecovillages

USA:  
Sustainable Design and Construction

Summer Term 2011  
June 20 – July 10, 2011

ACADEMIC CURRICULUM



UMASS  
AMHERST

<b>PROGRAM OVERVIEW</b>	<b>3</b>
<b>SIRIUS AS COMMUNITY</b>	<b>3</b>
<b>COURSE SYLLABUS</b>	
<b>SUSTAINABLE DESIGN AND CONSTRUCTION</b>	<b>4</b>
<b>COURSE DESCRIPTION</b>	<b>4</b>
<b>COURSE OBJECTIVES</b>	<b>4</b>
<b>LEARNING MODALITIES</b>	<b>5</b>
<b>COURSE OUTLINE</b>	<b>5</b>
<b>COURSE REQUIREMENTS</b>	<b>6</b>
<b>GRADING</b>	<b>8</b>
<b>COURSE BIBLIOGRAPHY</b>	<b>8</b>

## Program Overview

Green building is a broad term covering energy conservation, selection of low-impact materials, appropriate technologies, and life-cycle analysis. In this cutting-edge course students are introduced to the design and construction of ecologically sound structures. In addition, students experience working with various natural building techniques while gaining hands-on experience working alongside knowledgeable natural builders at Sirius Community – a model educational and sustainable ecovillage in scenic western Massachusetts. This is one of the few opportunities in the country to receive college credit and learn experientially about sustainable design and construction.

### *Sirius as Community*

Sirius was founded in 1978 by former members of the Findhorn Foundation who were inspired to create a similar community in the U.S. After a long search, they settled on 90 acres of land in western Massachusetts, which were once sacred grounds for local Native American tribes. The community was named after the brightest star in the sky and holds the vision of continually evolving as a spiritual community, a non-profit educational center, and an Ecovillage. Today, there are approximately 30 members at Sirius with many former members and supportive neighbors nearby.

Sirius has a commitment to living in harmony with the Earth. Examples of this lifestyle include using renewable energy sources (e.g., wind power and photovoltaics), organic gardening (e.g., integrated pest management, conscious attunement to plant energies, and permaculture techniques), green building (e.g., local, non-toxic materials, passive-solar design, super-insulation); recycling (e.g., free clothing store, re-using building materials, composting toilets). It also means striving towards simplicity, integrity, and non-violence in our relationships to each other, our environment, and ourselves.

# Sustainable Design and Construction

**Program:** Green Building and Sustainable Design at Sirius

**Department:** Natural Resources Conservation (Building and Construction Technology)

**Course Number:** BCT 496A

**UMass Faculty Sponsor:** David Damery

**LR Faculty:** Ryan Harb, Kay Cafasso, Llani Davidson

**Semester:** Summer 2011

**Credits:** 4

## *Course Description*

This is a practically oriented course that provides skills and techniques for ecological design and construction. The course is taught through both theoretical lessons in the classroom and hands-on experiences with various building projects. A variety of methods and materials are explored, including cob, timber frame, construction using recycled materials, straw bales and greenhouses. An emphasis is placed on energy efficiency, both in terms of embodied energy of materials and their capacity for insulation, the concept of ecological footprint, environmental cost, and planning that takes into account environmental factors such as the climatic and physical conditions of a given site. Basic structural engineering concepts are explored. Sustainability values as opposed to conventional values in design and construction are examined, and ways to elicit the necessary paradigm shift when dealing with normative architecture and engineering experts are discussed. In addition, appropriate technologies are investigated such as solar ovens, composting toilets and grey water systems.

The course also explores the concept of ecological design when applied to the community as a whole. Taking place at Sirius Community, an intentional community in Shutesbury, MA, the course examines the challenges involved in building sustainable community on the social, spiritual and economic level as well as the ecological.

The final week of the course is devoted to a group building project that ties together the methods and techniques that have been investigated into a hands-on learning experience that takes the students through the various stages of the construction process from beginning to end.

## *Course Objectives*

- Participants will be able to analyze the specific environmental conditions of a particular site and plan construction accordingly.
- Participants will understand concepts of ecological footprint and embodied energy and be able to apply them to a design process.

- Participants will gain practical knowledge and experience in the application of appropriate technologies as aids to achieving sustainability.
- Participants will acquire the knowledge and skills necessary to design and construct natural structures using local, low-energy and non-toxic materials.
- Participants will gain insights into the challenges and processes involved in building sustainable communities (social / economical challenges as well as zoning and regulations.)

### ***Learning Modalities***

The faculty teaching this course use lectures, case studies, discussions, site visits, small group work and hands on projects as key strategies to allow each student to develop mastery of course content.

### ***Course Outline***

The following is the order in which students will develop mastery of course content and Permaculture design principles.

**Week 1:** Focuses on local, low-energy, green buildings and building science.

**Week 2:** Focuses on natural building techniques and Sirius Community design project

**Week 3:** Construction Practicum and Ecovillage Living Immersion

*Note:* This outline is subject to change both before and during the course based on student learning goals, weather, and other factors.

#### I. The basis of sustainable design

- A. Context
- B. Problem Statement – what are we solving?
- C. What is green building?
- D. Culture, Ethics, Values
- E. Orientation to Sirius Community
- G. Primitive Shelter Exercise
- H. Site Tour

#### II. Principles: How to build "green"

- A. Design Processes and Methods
- B. Material Selection
- C. Embodied Energy
- D. Durability
- E. Design Team Formation & Tasks
- F. Green building certifications

#### III. The Design Process

- A. Climate & Landform
- B. “Waste” Treatment
- C. Goals Statements
- D. Site selection and client interviews

- E. Buildings, Infrastructure and Appropriate Technology
  - F. Zones of Use
  - G. Team Presentations
- IV. "Whole Systems Thinking"
- A. Design Process Overview
  - B. Incorporating the Outdoor Environment
  - C. Green Building and Permaculture
  - D. Design Schemes & Details
  - E. Ecological Economics: Personal & Political Scale
  - F. Design Project Wrap Up
  - G. Practicum Project

## ***Course Requirements***

### Course Documentation

#### **1. Weblog Assignments (pre-program and during)**

Each student is expected to complete at least one substantive web log entry prior to the beginning of the program (see pre-program assignment write up for details) and one entry over the course of the three-weeks at Sirius. Collectively, the web log entries of both students and staff are meant to clearly communicate to the world outside of the program the groups evolving experience at Sirius and understanding of green building issues on a personal, communal, regional and global level.

Each entry should be no shorter than 300 words and specifically reference relevant, key concepts, topics, activities and experiences that the group has explored since the last web log entry.

#### **2. Tour of a "Green Building" Assignment (pre program)**

*Step 1-* Each student is required to find and then visit a sustainable structure (residential or commercial building) prior to June 20. As you explore the site you are asked to find and document answers to the following questions:

- What is this building used for? (residential, office, school, commercial)
- How often is the building occupied and how many people use it?
- When was the structure built?
- What materials were used (methods of construction?)
- How is the structure heated? Cooled? (Oil, natural gas, propane, wood, renewables?)
- What is the total square footage?
- What is the thermal resistance (R-Value) of the walls, ceiling, flooring?
- What is the U-value of windows and doors?

*Step 2-* Students are asked to take pictures of specific green features of the building they explore. Students should bring no fewer than 5 printed pictures (at least 4" x 6" sheet of paper, preferably in color) one of which should be a picture of the buildings exterior. Students can make a power point of their pictures / findings for extra credit.

*Step 3-* Students are asked to read the Green building article provided by the faculty. Students are encouraged to take notes on the article and come to Sirius ready to discuss.

*Step 4-* Based on your experience and exploration of the Green building in your community and understanding of green building from the article, provide a detailed working definition of the term "green building". Students will be expected to share this definition on the first day of the program.

### **3. Practicum Project– Constructing a Sustainable Structure**

Students will become familiar with timber framing, straw bale and cob construction during this three week natural building intensive. By course end, students will be able to design and construct a four-season greenhouse for year-round food production plus other sustainable structures. The final assignment for this practicum is for students to present all of the alternative / natural energy technologies and how they are fit into "whole systems thinking." Students can choose how they want to document this; by poster, pamphlet, paper or video.

### **4. Final Design Presentations**

In small groups students will be required to design a new building for the Sirius Community. This will be an on-going project throughout the program and will require students to constantly reflect on how their learning on a daily basis informs their final design project. Selecting appropriate low-energy materials and construction methods are key aspects of the final design project as well as active engagement with the community.

The project will take place in the following stages. Student groups will:

- Interview Sirius community members to determine their short and long term needs as a community. This will invite students to more deeply understand Sirius's unique social and cultural structures.
- Document the long-term vision of the community and determine how their proposed structure will fit into the Master Plan.
- Be guided through the design of projects beginning with interviews of clients, needs assessment, development of real solutions, site and materials selection, embodied energy analysis and will culminate in formal design and presentations.

### Active Participation and Leadership

Students are expected to attend all classes and practical work sessions; come to class and work prepared (as directed before class/work by the instructor, for instance: with the right notebooks, writing implements, and books for class or the proper clothes, shoes, water, and hat for work); be

actively engaged in course activities, discussions and projects and take on a leadership role within certain aspects of the course. Students will be responsible for alerting the instructor before the start of class/work if there will be an anticipated absence or tardiness. Students will be individually assessed based on their willingness to engage themselves throughout the course, which includes their ability to get outside their comfort zones, see beyond their own worldview, and to interact with the course material in new and challenging ways.

## ***Grading***

In this course faculty actively promote multiple means of evaluation and authentic assessment including student self-assessment, peer assessment, faculty-student debriefs and rubric. In order for students to receive credit for this program through the University of Massachusetts, the faculty will submit a letter grade and written evaluation of each student's learning. Participants will furthermore be evaluated according to a demonstrated understanding of the methods, techniques and concepts taught throughout the course as expressed in the assignments listed above.

Green Building Assignment (pre-program).....	10%
Weblogs (pre-program and during).....	10%
Final Design Presentations.....	30%
Practicum and Alternative Technologies Assessment.....	30%
Active Participation and Leadership.....	20%

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