

**EVST 495.02 Green Building - Sustainability and Architecture:** strategies for Design, Construction, and Operation.

**M-W 6:10-7:30 pm Rankin Hall, Rm 202**

**Instructor:** Andy Lemann, andylemann@hotmail.com, 546-2272 Office Hours: Mon 5:15-6:00 pm and Wed 5:15-6:00pm: Rankin Hall, Room 107.

**Teaching Resources:** Louise Lakier, Russ Hellem, Steve Loken, Brian Kerns.

**Course Purpose:** The course is a broad introduction to the field of Green Building. It is designed to introduce students to the fundamental principles of Green Building, Energy Efficiency, Passive Solar Design, and a variety of Green Building Certifications including the US Green Building Council's LEED® program. By utilizing LEED case studies, this course will analyze environmental impacts required for the built environment and methodology for reducing these impacts. (As much as possible it is intended for the course to be paperless. Assignments, reading materials, etc will be done online).

### **Texts:**

No books will need to be purchased for the class. Required reading material will be available online. Reference may be made to the following publications:

Chiras, Daniel D. 2002. *The Solar House: Passive Heating and Cooling*. Chelsea Green Publishing Company, VT.

Lstiburek, Joseph. 2006. *Builder's Guide to Cold Climates: A systems approach to designing and building homes that are safe, healthy, durable, comfortable, energy efficient, and environmentally responsible*. Building Science Press.

Pearson, David. 1998. *The New Natural House Book: Creating a Healthy, Harmonious, and Ecologically Sound Home*. Fireside, NY.

### **Syllabus**

#### **Week 1**

**Mon, Jan 25<sup>th</sup> : What is Green Building? Instructor to lead class discussion on the principles of Green Building. Class to compile a list of the ten most important concepts. (AL)**

HW: each student to rank these ten principles in order of what they consider the most important. Email answers to instructor by Wednesday, 5pm.

**Wed, Jan 27<sup>th</sup> : What is Green Building? (cont.) Review class list of top ten Green Building Principles and compare our list with national Green Building Certification programs (LEED®, National Green Building Standard, Passive House). Introduction to Google SketchUp® and Google Earth® as tools for Green Building Design.**

HW: instructor will provide a list of shapes – students to draw the shapes using Google SketchUp. Email .skp file to instructor by Sunday, 5pm.

### Week 2

**Mon, Feb 1<sup>st</sup> : Introduction to Student Projects. Instructor will outline the requirements for Student Projects, deadlines for submissions, and grading expectations. Instructor will demonstrate simple techniques for creating a house model and placing it on a site using Google SketchUp® and Google Earth®. (AL)**

**Wed, Feb 3<sup>rd</sup> : Introduction to Green Building Certifications – comparing and contrasting some of the different national programs (AL)**

HW: complete the house begun in class in Google Sketchup® and place it on a site in Google Earth®. Follow online lessons for using SketchUp® and Google Earth®. Email completed .skp files to instructor by Sunday, 5pm.

### Week 3

**Mon, Feb 8<sup>th</sup> : Energy Efficiency and Building Science in practice (RH)**

Introduction to concepts of Integrated Design and Performance Based Design.

HW: Read online material

**Wed, Feb 10<sup>th</sup> : Site Visit – Russ Hellem Duplex (RH)**

HW: For each item in the class' list of top ten green building principles describe one thing that the building does well and one thing that it could do better. Read online material and answer short quiz. Email answers to instructor by Sunday, 5pm.

### Week 4

**Mon, Feb 15<sup>th</sup> : Holiday**

**Wed, Feb 17<sup>th</sup> : Passive Solar Design Principles (AL)**

Site Selection, Orientation, Windows, Eave Overhang, Room Layout

HW: Read online material

### Week 5

**Mon, Feb 22<sup>nd</sup> : Passive Solar Design Principles (AL)**

Insulation, Thermal Mass, Air sealing, Ventilation, Landscaping.

HW: Read online material

**Wed, Feb 24<sup>th</sup> : Passive Solar Design summary and examples. (AL)**

Case Study – Green Building from a client's perspective. (Zia Maumenee)

HW: Read online material and answer quiz. Email answers to instructor by Sunday, 5pm.

### **Week 6**

**Mon, Mar 1<sup>st</sup> : Introduction to Alternative Energy systems. (AL, BK)**

HW: Read online material.

**Wed, Mar 3<sup>rd</sup> : Site visit – Alternative Energy Projects. (BK)**

HW: Read online material.

### **Week 7**

**Mon, Mar 8<sup>th</sup> : Site Visit – Maumenee House and Elk Ridge strawbale?(AL)**

HW: For each of the ten passive solar design principles give the house a score between 0 and 10 and briefly describe why you give it that score. Email answers to instructor by Sunday, 5pm.

**Wed, Mar 10<sup>th</sup> : Guest Presenter – Green Remodelling - Nationally recognized Green Building champion and Missoula resident, Steve Loken.**

### **Week 8**

**Mon, Mar 15<sup>th</sup> : Work on Student Projects – instructor assistance with Green Building Rating Systems (AL, LL)**

HW: Refine Green Ratings and List of Green Building Features.

**Wed, Mar 17<sup>th</sup> : Class Discussion – Green Building Rating Systems – Do they make for Greener buildings? (AL, LL)**

HW: Green Rating results due. Email files to instructor by Sunday, 5pm.

### **Week 9**

**Mon, Mar 22<sup>nd</sup> : The LEED® Green Building Rating Systems in detail (LL)**

HW: Read online material

**Wed, Mar 24<sup>th</sup> : The LEED® Green Building Rating Systems in detail (LL)**

HW: Read online material and answer short quiz. Email answers to instructor by Sunday, 5pm.

### **Week 10**

**Mon, Mar 29<sup>th</sup> : Spring Break**

**Wed, Mar 31<sup>st</sup> : Spring Break**

### **Week 11**

**Mon, Apr 5<sup>th</sup> : Site Visit – Native American Center, UM's first LEED certified building – tour with campus architect, Jameel Chaudhry and Project Manager, Louise Lakier.**

**Wed, Apr 7<sup>th</sup> : Site Visit – Missoula Federal Credit Union, Russell Street branch – Missoula’s only LEED® rated Platinum building. (AL/LL)**

HW: For each item in the class’ list of top ten green building principles describe one thing that each of the buildings toured this week does well and one thing that it could do better. Email answers to instructor by Sunday, 5pm.

Note:

### **Week 12**

**Mon, Apr 12<sup>th</sup> : Other Green Building rating systems – more about the National Green Building Standard, Energy Star, Passive House, etc.**

HW: Read online material

**Wed, Apr 14<sup>th</sup> : Beyond Green Building (AL)**

HW: Read online material and answer short quiz. Email answers to instructor by Sunday, 5pm.

### **Week 13**

**Mon, Apr 19<sup>th</sup> : Work on Student Projects – instructor assistance with finalizing Google SketchUp® models (AL)**

HW: Refine Google SketchUp® models, Lists of Green Design Elements, Green Ratings, Energy Models, and presentations.

**Wed, Apr 21<sup>st</sup> : Work on Student Projects – instructor assistance with uploading completed Google SketchUp® models to Google Earth®. (AL, LL)**

HW: Finalize presentations. Google SketchUp® models and Green Design Element Lists due (plus Energy Model results for grads). Email results to instructor by Sunday, 5pm.

### **Week 14**

**Mon, Apr 26<sup>th</sup> : Presentation of Student Projects (AL)**

**Wed, Apr 28<sup>th</sup> : Presentation of Student Projects (AL)**

### **Week 15**

**Mon, May 3<sup>rd</sup> : Presentation of Student Projects (AL)**

**Wed, May 5<sup>th</sup> : Conclusions – class discussion about what we’ve learned plus a look at some examples, what’s green and what’s not. (AL)**

## **Assignments**

**Weekly assignments:** There will be short assignments, reports and quizzes due each week on Sunday by 5pm (unless otherwise noted). Each assignment will count for 2-4% of the final grade at the instructor’s discretion. The total for all of these will account for 25% of the final grade.

**Student project:** Each student will design a green home, create a 3D model of it using Google SketchUp®, select a site for it, place the model on the site using Google Earth®, perform a solar study on it, write a list of the Green Features of the design, and rate it using one of the national Green Building rating systems (the National Green Building Standard or LEED® for Homes). (*Graduate students* will perform an Energy Model on their design, rate their home using either the National Green Building Standard or LEED® for Homes and another Green Building Rating system of their choice, and compare the two rating systems).

As part of their final presentation each student will be expected to review their project with reference to the class' list of top ten Green Building principles.

***Schedule and Grading:***

**Green Rating Results** will be due on Sunday, March 21<sup>st</sup> by 5pm. These will be graded according to thoroughness, accuracy, and realistic approach. They will account for 10% of the final grade.

**Completed 3D Models, Lists of Green Design Elements, (and Energy Models for Grads)** will be due on Sunday, April 25<sup>th</sup> by 5pm. These will be graded according to demonstrated proficiency with use of the software programs and grasp of fundamental Passive Solar Design concepts. 3D models will account for 10% of the final grade and Lists of Green Design Features will account for 5%. (For grads 3D models 5%, Lists 5%, and Energy Models 5%)

**Final project presentations** will be given in class on the dates shown above. Each undergraduate student will have 10 minutes in which to show their 3D model, briefly describe their project and its Green Design Elements, present the results of their Green Building rating, and explain what makes their home green according to the class' list of top ten Green Building principles. (Graduate students will have 15 minutes in which to present their projects as above plus describe their energy model and results, and give a comparison of the two Green Building rating systems used).

The final presentations will be scored by each member of the class plus the instructor(s) and the final grade will be compiled from these scores. Final presentations will account for 25% of the final grade.

Failure to complete an assignment will result in a zero for that assignment grade. The above assignments will account for 75% of the final grade.

**Attendance:**

The class is intended to be an interactive experience where all students and instructors learn from each other. Therefore attendance and enthusiastic participation will account for a significant portion of the final grade. Make-ups may not be possible and only those arranged ahead of the class period will be permitted. This requires that you contact the lead instructor, Andy Lemann by e-mail or phone prior to class if you are sick or cannot otherwise attend. Any work missed due to an excused absence will be able to be made up by the end of the week following the student's return to class.

Attendance and participation will account for 25% of the final grade.

### **Learning Objectives**

1. Understand the fundamental principles of Green Building.
2. Understand the principles of Energy Efficient Design, Passive Solar Design, Integrated Design, and Performance Based Design.
3. Understand and implement basic building design skills using Google SketchUp® and Google Earth®.
4. Understand general principles of alternative energy systems.
5. Understand the fundamentals of Green Building rating systems including the USGBC's LEED® Rating System.
6. Gain skills in researching and presenting Green Building concepts.
7. Develop written, visual, and oral communication skills.
8. Graduates to understand fundamentals of Energy Modelling and comparison or different Green Building rating systems.