PASSIVE HOUSE DESIGN + DETAILING
ADVANCED TECHNICAL ELECTIVE
Department of Architecture | University of Oregon
Spring Term 2012

ARCH 4/510 (4 credits) | P/NP or Graded | CRN: 37684/37685
Prerequisites: Building Construction & ECS 1
Time/Location: Tues/Thurs. 4:00-5:50pm | 278 Lawrence Hall
Final Exam: Thursday, June 14th 1:00pm

Instructor: Matt Hogan, 100 Pacific Hall
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COURSE DESCRIPTION

The Passive House concept is widely considered the most ambitious performance-based energy standard for buildings. Through the implementation of contemporary building science along with comprehensive energy modeling, Passive Houses on average use 90% less energy for space conditioning than code-designed houses. The rigorous performance requirements of the Passive House standard aim to play a vital role in reducing building sector fossil fuel consumption and carbon emissions. Over the past fifteen years, thousands of homes and commercial buildings have been built to the Passive House standard throughout Europe. Recently, the movement has migrated to North America, with over 25 Passive Houses currently certified across the United States and many more in various stages of development.

This course will provide an in-depth understanding of Passive House design, detailing, and construction principles with a specific focus on building envelope and mechanical system design. Emphasis will be placed on advanced building science topics including superinsulation, thermal bridge free detailing, moisture protection, airtight construction, and high performance building components. Further, the aesthetic implications of Passive House design and principles will be discussed. Cutting-edge analysis software including THERM, WUFI, and the Passive House Planning Package (PHPP) will be taught and incorporated into course assignments. Class time will be split between lectures and hands-on lab activities. The final project will require students to develop a small Passive House design, including building plans & sections, envelope details, a mechanical plan, and a PHPP energy model.

STUDENT OUTCOMES
- Increase understanding of the Passive House building envelope and mechanical systems
- Gain ability to model building science topics such as heat transfer, thermal bridging, and moisture control
- Learn several design and analysis tools for constructing high performance structures
COURSE FORMAT

Class time each week will be split between a lecture and an in-class lab activity. Each Tuesday, the lecture material for the week will be presented. There will be ample opportunities for class discussion and Q&A. Additionally, guest speakers are invited to present their experiences with Passive House projects and aspects of the design process. On Thursdays, the majority of class time will be devoted to in-class, hands-on activities which are intended to complement the week’s lecture material. Weekly exercises will be given during the first half of the term. These exercises will be completed outside of class; however, the tools needed to complete the exercises will be discussed during the lab portion of the class. A final project will be assigned for the second half of the term and will require students to complete the design of a small Passive House based on a given set of parameters.

REQUIRED MATERIALS

Passive House Planning Package (PHPP) software (more info to come)
Pilkington Sun Angle Calculator
Climate Consultant (free download from http://www.energy-design-tools.aud.ucla.edu/)
THERM software (free download from http://windows.lbl.gov/software/therm/therm.html)
WUFI software (free download from http://www.ornl.gov/sci/ees/etsd/btric/wufi_software.shtml)

GRADING & EXPECTATIONS

This course may be taken as either graded or P/N. In order to receive a “Pass” for the course, undergraduate students must receive a minimum grade of C minus; graduates must receive a minimum grade of B minus. Grades will be based on class participation, in-class activities, five exercises, and the final project.

A+ = 97.5-100%, A = 92.5-97.4%, A- = 89.5-92.4%
B+ = 87.5-89.4%, B = 82.5-87.4%, B- = 79.5-82.4%
C+ = 77.5-79.4%, C = 72.5-77.4%, C- = 69.5-72.4%
D+ = 67.5-69.4%, D = 62.5-67.4%, D- = 59.5-62.4%

Students are expected to attend class and participate in class discussions. Exercises should be completed in a professional format and should demonstrate care, craft, and an understanding of course material. When completing calculations, all work must be shown and all units must be included in order to receive full credit. You must accurately cite sources in your work. Exercises are due at the beginning of class on the due date. Late work will be accepted after this point with a late penalty of 5% per day for a maximum of one week.

NAAB CRITERIA

This course addresses the following 2009 NAAB Student Performance Criteria. Bold items are addressed explicitly:

B.3 Sustainability
B.8 Environmental Systems
B.10 Building Envelope Systems
B.12 Building Materials & Assemblies
C.1 Collaboration
C.2 Human Behavior