ENGR 4630: Design of Residential Structures
Fall 2015
Tuesday, Thursday 2:00 – 3:15 pm

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Office Hours: By appointment

Text: International Residential Code for One and Two-Family Dwellings – 2015
Available from
ICC: $128.00 (soft cover) or $122 PDF download
http://shop.iccsafe.org/2015-international-residential-code.html
Amazon: $112 (soft cover)
http://www.amazon.com/2015-International-Residential-Two-Family-Dwellings/dp/1609834704

Course Objectives

This course will provide the student with multiple learning opportunities to expand their engineering knowledge and experience. We will focus on both the technical and professional areas of engineering.

– Technical:

- Design options and process of residential structures
- What does it take to actually design and construct a house (the process)?

– Professional:

- Transition from undergrad student mindset to a 'real' practicing engineer

This course will provide an overview of the design principles for residential structures. This includes the design of foundations; structural members; heating and cooling systems; water supply distribution and waste removal; electrical systems; and lighting. The course will introduce the student to the process of selecting key equipment and systems based on engineering principles, including thermal insulation, vapor barriers, windows and doors, and HVAC equipment. Other practical issues that are important to the design and construction of a house, such as house siting, construction contracts and emerging technologies, are also covered.

Course Learning Objectives Matrix

Course Learning Objectives	Course Assessment Methods*	Extent of Coverage of Program Outcomes** (ABET Criterion 3)
Upon successful completion of this course, the student will be able to:		
Perform engineering calculations for structural load problems involving residential structures, be able to make relevant simplifying assumptions	D	axxx, cxxx, exx, fx, kxx
Understand the relevant processes outside of engineering design that are involved with residential construction, such as building codes and financing	A, D	cxx, fxxx, gx, hxx, ixxx, jxx
Perform basic system load and equipment sizing calculations for common systems such as plumbing, electrical and HVAC.	A, D	axxx, cxxx, exx, fx, hx, kx
Understand how to better communicate engineering and the design decisions that go into the design of a house.	D	axx, cxxx, gxxx, kxx

* Course Assessment Methods: A – Homework and In-class Exercise; B – Hourly Exam; C – Final Exam; D – Project; E – Student Evaluation
** Extent of Coverage: x – some, xx – moderate, xxx - extensive

ABET EC-2000 Criterion 3 Program Outcomes

a) an ability to apply knowledge of mathematics, science, and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to design a system, component, or process to meet desired needs
d) an ability to function on multi-disciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

Overall Course Contribution to Program Outcomes

a, c, f – extensive e, h, i, k - moderate g, j - some

In addition, this course will provide the student with skills that are applicable to working in an engineering design or construction position, plus practical knowledge for their own personal lives. In-class examples and guest lectures will bring in real life applications of the principles and concepts covered. An additional

opportunity for real world appreciation of the concepts covered in this class will be available via an optional service work in house construction with the local Habitat for Humanity organization.

The primary learning opportunity will be in the semester long project to design a residence of your selection, within guidelines set by the instructors.

Course Prerequisites (at least topical knowledge of):
ENGR 2110 Engineering Decision Making (recommended)
ENGR 2140 Strength of Materials - required
ENGR 2170 Electrical Circuits - required
ENGR 3150 Heat Transfer - required
ENGR 3160 Fluid Mechanics - required

Course Topics

Part I: Introduction and Concepts
- Site selection
- Codes, permits and inspections
- Financing
- Construction contracts
- Software demonstration

Part II: Structural
- Floorplans and house layout
- Foundations and footings
- Structural support members
- Roofing

Part III: General Mechanical and Electrical Systems
- Plumbing and waste removal
- Electrical supply and lighting
- Roofing, attics
- Windows and doors
- Sample house design

Part IV: Heating, Cooling and Related Components
- Heating and cooling load calculations
- Indoor air quality
- Thermal insulation and vapor envelope
- Systems and equipment
- Duct design and sizing
- Building Energy Simulation

Part VI: Miscellaneous Applications and Emerging Technologies
- Sustainable residential design

Course Grading

Homework and in-class work **25%**
(includes sample house exercises, in-class exercises, class participation @ 5%)

House design project **75%**
Periodic assignments and possibly update reviews that detail different aspects of the design, final report

General Course Policies

- ***Attendance.*** *Class attendance is mandatory*. Absences are only allowed in case of illness, emergencies, or special circumstances. In case of absence, a written notice or explanation must be submitted to the lecturer. Lectures and discussions in class will serve as an overall summary of the topic. *There will be no opportunity to make up missed assignments or classroom exercises.* In case of serious illness or emergency, your grades will be prorated. A student may be withdrawn from this course by the instructor without notification to the student for excessive absences or for failure to complete necessary prerequisites. For this course, "excessive absences" is defined as absences from all of the first three class meetings or five (5) or more absences from any contiguous ten (10) scheduled class meetings.
- ***Preparation.*** You will be expected to come to class prepared for each session. You are also expected to be making regular progress on your design project through the course of the semester.
- ***Participation.*** You are encouraged to ask questions during class regarding any aspects that are unclear to you. This will keep the class interesting for all and aid in learning by all. In addition, you may be called upon to answer questions, to comment on problem solutions, and/or lead discussions related to the lecture material. Demonstrating reasonable participation will require daily preparation and staying current with assignments. Daily observations of your class participation will be made and recorded through the semester and used to determine the participation portion of the final course grade. For each day recorded, 5 points will be given for active participation in the class session, 4 points for attendance only, and 3 points for attendance with some negative such as a late arrival. At the end of the semester, the points are totaled for everyone. The person with the highest total points is assigned a 100% on the participation portion and all others are scaled to that total point level.
- ***In Class Assignments.*** In class exercises will be done either individually or in small groups that will help you prepare for your own project activity. Exercises may be required to be finished at home and turned in next class session. The exercises will revolve around basic calculations needed to design a house. **Bring calculator and extra paper to class on the class work sessions to be prepared.**
- ***Project Review and Work Days.*** A few days are scheduled for review of your project progress and a general work day. Be prepared to demonstrate progress on your project house; bring copies of the house plan with you to class and be ready to work on the current design topic.
- ***Homework.*** This course requires a significant investment of time and outside work that actually consist of the primary learning opportunities. The sample house exercises are in essence homework problems as practice for the design of your house project.
- ***Exams and Quizzes.*** No exams *per se* are planned for this course. Be prepared to describe the progress you have made in the particular design segment at any class meeting.
- ***Communication Quality.*** The general UGA policy of having at least 30% of the grade on written materials reflect the quality of written communication will be applied. For this course, the primary written and oral communication is expressed in terms of the organization of your assignments outlining progress on the project and the investigation study paper. Important note: In industry and the workplace if you can not effectively communicate your results to your supervisor, clients, or co-workers, then in essence you have not completed the task and it never happened.
- ***Grading.*** Grading will be approximately the typical 90/80/70 scale, but scaled if necessary.
- ***Ethical Conduct.*** Communication between students in working on in-class exercises and project work is encouraged. Students are expected to maintain the high ethics of the engineering profession during the course; unethical behavior such as copying work of others or not giving proper citation reference will be dealt with severely according to the policies and procedures on academic honesty of the University of Georgia.
- ***General.*** As a courtesy to all, please turn off all cell phones, pagers, etc. are to be turned off before class starts.

University and Departmental Policies

ACADEMIC HONESTY

The University of Georgia seeks to promote and ensure academic honesty and personal integrity among students and other members of the University Community. A policy on academic honesty has been developed to serve these goals. All members of the academic community are responsible for knowing the policy and procedures on academic honesty. The document for academic honesty may be found at the web site for The University of Georgia Office of Senior Vice President for Academic Affairs and Provost.

ENGINEERING PROFESSIONALISM POLICY

Engineers make great contributions to society. Engineering is a very satisfying profession that provides many rewards but is demanding and requires hard work. The engineering profession is governed by a code of ethics. Engineering faculty at UGA expect students to act in a professional manner at all times and develop the work ethics required for a successful engineering career. Engineering students at UGA are responsible for maintaining the highest standards of professionalism and professional practice.

DEPARTMENTAL GRADING POLICY REGARDING COMMUNICATION SKILLS

Thirty percent of the grade on all written assignments (lab reports and papers) and oral presentations will be based on quality of communication. Spelling, grammar, punctuation, and clarity of writing are evidence of written communication quality. Enunciation, voice projection, clarity and logical order of the presentation and effective use of visual aids are evidence of oral communication quality.

All academic work must meet the standards contained in "A Culture of Honesty." Students are responsible for informing themselves about those standards before performing any academic work. The link to more detailed information about academic honesty can be found at: http://www.uga.edu/ovpi/honesty/acadhon.htm

2015 Fall Semester Academic Calendar

Orientation	Aug. 12	Wednesday
Advisement	Aug. 13	Thursday
Registration	Aug. 14	Friday
Classes Begin	Aug. 17	Monday
Drop/Add for undergraduate level courses (1000 – 5999) and graduate level courses (6000-9999)	Aug. 17 – Aug. 21	Monday - Friday
Holiday: Labor Day – No Classes	Sept. 7	Monday
Midterm	Oct. 6	Tuesday
Withdrawal Deadline	Oct. 22	Thursday
Fall Break	Oct. 30	Friday
Last Day of Classes Prior to Thanksgiving Break	Nov. 20	Friday
Holidays: Thanksgiving	Nov. 23 – 27	Monday - Friday
Classes Resume	Nov. 30	Monday
Friday Class Schedule In Effect*	Dec. 8	Tuesday
Classes End	Dec. 8	Tuesday
Reading Day	Dec. 9	Wednesday
Final Exams	Dec. 10, 11, 14, 15, 16	Thurs. – Fri., Mon. – Wed.
Commencement	Dec. 18	Friday
Grades Due	Dec. 21, 5 PM	Monday, 5 PM

***Note: For the Fall Semester 2015, the University will operate a Friday class schedule on Tuesday, Dec. 8.** This is done to equalize the class minutes between MWF and TTH classes and to provide an equal number of class meetings for courses which may meet only once per week.