

UNIVERSITY OF CALIFORNIA – BERKELEY
Department of Civil and Environmental Engineering,
Department of Architecture and
Jacobs Institute for Design Innovation
Spring Semester 2016



A undergraduate course in Jacobs Institute for Innovative Design, UC Berkeley

CE-190-002-Innovative Sustainable Residential Design + ARCH-159-Innovative Sustainable Residential Design

3 UNITS

Lectures: Tuesdays 9:30-11:00A, 210 Jacobs Hall

Design Lab: Thursdays 9:30-12:30P, 210 Jacobs Hall

Office Hours for Faculty and GSI: Please see bCourse Site

Faculty Instructors:



Prof. Abolhassan Astaneh, Ph.D., P.E.,
Dept. Civil and Env. Engineering
781 Davis Hall,

Web: www.ce.berkeley.edu/~astaneh

Email: astaneh@ce.berkeley.edu

Office Hours: See bCourse site



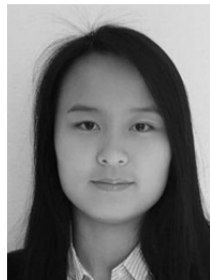
Prof. R. Gary Black
Architecture Department
478 Wurster Hall

Web: <http://ced.berkeley.edu/ced/faculty-staff/r-gary-black>

Email: gary_black@integratedstructures.com

Office Hours: See bCourse site

Graduate Student Instructors

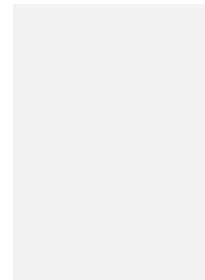


Juejin Lu, GSI

Email: juejinlu@berkeley.edu

LinkedIn: www.linkedin.com/in/juejin-lu-0b280586

Office Hour: See bCourse site



Graduate Student “Reader”
Appointed 10 hours/week to assist
Faculty in grading Course Assignments.
(The identity of the “Reader” is not
public information.)

Course Description:

1. Prerequisites:

a. Prior course:

No prerequisite exists for this course, however, junior or senior standing in Civil and Env. Engineering or Architecture is required.

b. Knowledge and skills needed to succeed in this course:

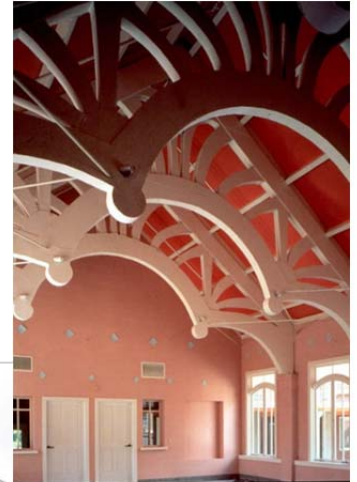
Knowledge of structural systems for buildings; basic concepts of structural analysis such as equilibrium and free body diagram; and knowledge of basic properties of construction material such as concrete, steel and wood is desirable.

c. Permission of Instructor needed?

Students from departments other than CEE and ARCH can also enroll in this course; however, they will need permission of the instructors to ensure they have the necessary background and basic knowledge to excel in this course.



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2. Course Content:

Following is a semi-final list of items planned to be covered each week. Since this is a first offering of this course, students should expect some changes in the items listed below.

- 1st Week (Jan 19 & 21): Introduction to the course and Administrative Items such as getting Makers Pass
- 2nd Week (Jan 26 & 28): Team Work and Ethics
- 3rd Week (Feb 2 & 4): Introduction to Structural Design
- 4th Week (Feb 9 & 11): Introduction to Architectural Design
- 5th Week (Feb 16 & 18): Architectural Design of the Term Project: Innovative and Sustainable Residence
- 6th Week (Feb 23 & 25): Architectural Design of the Term Project: Innovative and Sustainable Residence
- 7th Week (Mar 1 & 3): Energy Efficiency in Residential Design
- 8th Week (Mar 8 & 10): Architectural Design of the Term Project: Innovative and Sustainable Residence
- 9th Week (Mar 15 & 17): Structural Design of the Term Project: Innovative and Sustainable Residence
- 10th Week (Mar 29 & 31): Sustainability Issues related to Term Project: Innovative and Sustainable Residence
- 11th Week (Apr 5 & 7): Structural Design of the Term Project: Innovative and Sustainable Residence
- 12th Week (Apr 12 & 14): Structural and Foundation Design of the Term Project: Innovative and Sustainable Residence
- 13th Week (Apr 19 & 21): Any Other Remaining Design Issues to Complete the Term Project
- 14th Week (Apr 26 & 28): Team Project Presentations by the Student Teams to the Class and the Jury
- 15th Week (May 3 & 5): Public Presentation of Team Design Projects at Jacobs Institute Project Showcase

3. Overview of the Course:

a. What is the course about: its purpose, rationale?

The course teaches students how to design a residential home that has an innovative design in terms of its architectural and structural engineering aspect with emphasis on sustainability and energy efficiency.



<http://www.tippingstructural.com/>

b. What are the general topics or focus?

The focus of this course is on the architectural and structural design with sustainability and energy efficiency being included in all aspects of design process from beginning conceptual stage to the final design. The course introduces students to one or more comprehensive architectural and structural design problems; design teams conceive the architecture of the residence and structural system; conduct architectural design with emphasis on aesthetics, economy, sustainability, construction



<http://www.babble.com/>



<http://www.babble.com/>

and energy efficiency; determine the loads; design the structure of the home and its foundations using traditional material such as steel, concrete, and wood or use innovative non-traditional material; more wood structure or a structure made of and its foundation; prepare construction cost estimate; prepare final report containing project description, design criteria, cost estimate, architectural and structural drawings, and supporting calculations; and make "client" presentations as required. See syllabus on previous page for more details

c. How does it fit with other courses in the department or on campus?

This course will serve as the capstone course in structural engineering after it has gone through Campus Course Approval Process. At this first offering the course is a Technical Elective. The course is part of structural engineering program of the civil and environmental engineering department.



<http://inhabitat.com/>

d. Who is the course aimed at?

The course is aimed at seniors in civil engineering and architecture.

e. Why would students want to take this course and learn this material?

The material is needed for civil engineers and architects who will get involved in any aspect of architectural and structural/seismic design, cost estimation, construction, inspection, failure analysis or damage investigation of building structures.



www.marstructuraldesign.com

4. Student Learning Objectives:

a. What will students be expected to know or do after this course?

The students after this course will know how to design a typical residential building from architectural and structural engineering point of view such that the architecture of the building is aesthetic, functional and the structure is safe and economical. That knowledge can be very useful when the students enter the practice of architectural and structural design. The students also will

know how to work within a team, with single goal of producing and innovative and sustainable design and how to present their work to “clients”.

b. What competencies/skills/knowledge will students be expected to demonstrate at the end of the course?

The students are expected to demonstrate their knowledge of how to develop architectural concepts to satisfy architectural criteria imposed on the design and how to design the structure to carry gravity and lateral loads, how to analyze a model of the structure using SAP analysis software, how to estimate the cost of construction, how to prepare a professional technical report on their design and how to present their work orally to their peers and clients. They also will learn how to make a 3-D printing of their final designed residence.



<http://www.baume.info/>

5. Methods of Instruction:

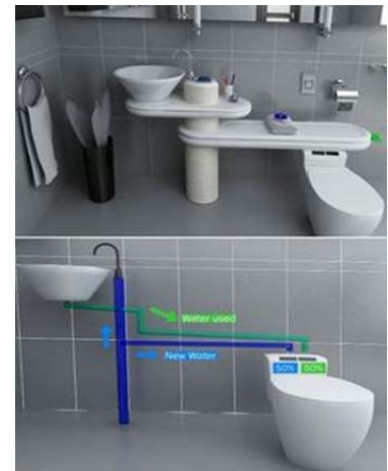
There is one 1.5-hour Lecture every week with 5 minutes break in the middle on Tuesday (9:30-11:00A), and a 3-hour Design Lab Session per week on Thursday (9:30-12:30P). The course assignments consist of “Research Papers” prepared by students on topics assigned throughout the semester, an Ethics Paper, Design Assignments, two “Progress Reports”, a “Final Report” and “Final Presentation”. These are explained in more detailed below.

a. Lectures:

The 1.5-hour Lecture Sessions will be spending on having faculty instructors and invited expert speakers discuss specific topics related to the syllabus item for that week with students. All students are required to attend all lectures. Attendance will be taken at the start of the lectures.

b. Design Lab Sessions:

The 3 hours Design Lab Sessions will be primarily used by student teams to work on their design project throughout the semester. The Design Lab Sessions will be done by the GSI, with faculty member participation during part of the 3 hour to answer specific student design team’s questions. All students are required to attend all Design Lab Sessions. Attendance will be taken at the start of the Lab Sessions.



<https://www.pinterest.com>

c. Research Papers:

Throughout the semester, students will be assigned topics that they will research and submit a “Research Paper” on assigned topic on or before the due date. No late submittal will be accepted. Research papers are done by each student (and not as a team) and each student will be graded on their efforts and will be assigned a grade based on quality of the paper and its completeness. Research papers, as well as all other work in this course need to be prepared without any plagiarism and unethical activity. All academic misconducts will be reported to the University for Appropriate Action.

d. Ethics Paper

The students will do a case study on a building, bridge or other structure that involved clear case of ethical or unethical conduct on the part of an architect or a civil/structural engineer that resulted in avoiding or causing serious failure or other public safety problems.

e. Design Assignments

Unlike the Term Design Project that is done throughout the semester, the Design Assignments are small design tasks that students undertake for duration of a week or so and focus on a specific design item.

f. Progress Reports:

Each Student Teams will prepare and submit two progress reports with deadlines of March 1st, and April 7th on their Design Project progress. The format of the Progress Reports will be posted on the bCourse early in the semester.

g. Final Design Report:

Each Student Teams will prepare and submit a Final Design Report for their design by 5:00PM on Monday April 25, 2016. No late submittal will be accepted. The format of the Final Design Report will be posted on the bCourse in mid-March.

h. Design Project Presentation:

Students in each Design Team will present their design during the last week of Instruction on Tuesday April 26 and Thursday April 28 from 9:30-11:00.

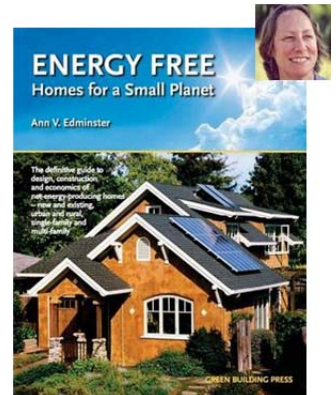


zeroHouse needs no outside utilities
<http://www.babble.com/>

6. Primary or Required Books/Readings for the Course:

Energy Free Homes for a Planet, by Ann V. Edminster, Green Building Press, 2009 (\$25.00). The book can be ordered here:

<http://www.greenbuildingpress.com/energy-free>



7. Other Materials:

Software: SAP2000, Latest Version. This is the software that we will use in this course. The software is developed by the Computers and Structures Inc.

<http://www.csiberkeley.edu>.) Helpful information on how to use SAP2000 is at:

<http://www.csiberkeley.com/sap2000/watch-and-learn#page=page-1> .

The software is installed in all computers in Davis Hall computer labs. You can run the software by clicking on.



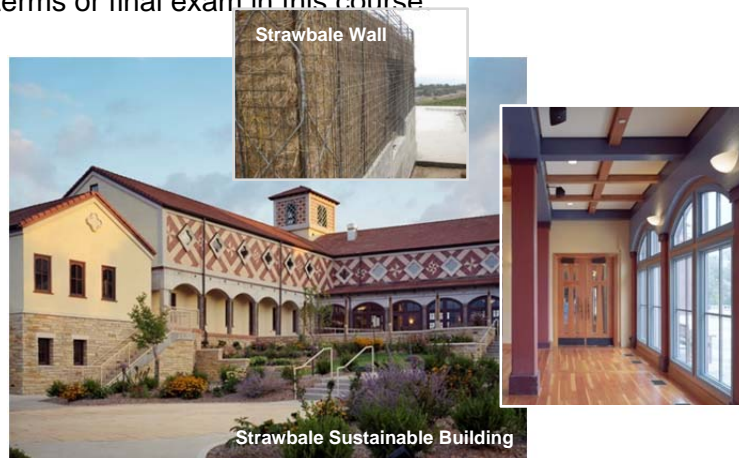
8. Assigned Work:

Assigned work includes reading, research paper, ethics paper, progress reports, final design report and final report. There will be no midterms or final exam in this course

9. Grading:

Grading will be based on

Attendance	(10%)
Research Papers	(15%)
Ethics Paper	(5%)
Design Assignments	(10%)
Progress Reports	(20%)
Final Design Report	(25%)
Final Presentation	(15%)



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