ARCHITECTURE AND ENERGY SYSTEMS

SYLLABUS

Ben Uyeda           eMail: bu@freegreen.com
Office hours: by email appt.
11:45-1:25 Tuesday
11:45-1:25 Friday

Required Text:

Heating, Cooling, Lighting: Sustainable Design Methods for Architects
Third edition

By Norbert Lechner

Description: This course will introduce architecture students to Architecture and Energy Systems as both a problem of knowledge and design as well as the pragmatics of integrated Architecture and Energy Systems.

Course prerequisites: This course requires that the below listed prerequisites be completed satisfactorily before you will be allowed to take this course. If it is discovered that you have not completed these prerequisites, you may be dropped from the course at any time during the semester.

- PHY 141 Physics 1 for Engineers
- MTH 241 Calculus 1 for Engineers
- ARC U356 Structures 1: Statics
- RC U357: Structures 2: Tectonics

Attendance: Attendance is required at all course meetings. More than two excused absences will result in the reduction of the final letter grade. More than three unexcused absences will result in a failure of the course. Some content in the lectures may seem abstract, opaque, new, or otherwise deserves clarification. Wise students will ask questions, seek clarification, and thoroughly understand the problems of knowledge and design, the theories, techniques, and technologies, and the case studies discussed in the lectures.

NAAB Student Performance Criteria: The work that students produce toward their degree granted by the School of Architecture is the property of the School of Architecture. The complete course work from selected students shall be collected by the School for each course taught for the National Architecture Accreditation Board [NAAB] documentation. Students are encouraged to document their work for their personal portfolio if it is requested by the School for the NAAB, but the work must be submitted to the professor no later than one week after final exams week. This course meets the following NAAB Student Performance Criteria to the extent designated:

12.15: Sustainable Design Ability
12.19: Environmental Systems Ability
12.22: Building Service Systems Understanding

Sustainability: There is little lecture content, if any, in this course that is not informed by and directed towards sustainable principles. While there has been a good deal of hand-waiving and spilt ink about sustainability over the past years, it is the position of this course is that if sustainability is important then it should be simply integrated into technical and social practice rather than remain the province of a few isolated individuals on the fringe that claim and market it as an area of specialty. Most of ‘sustainability’ is common sense from technical, ecological, economic, and social viewpoints. These principles best represent intelligent practices rather than a litany of narrowly defined recycled rhetoric, hand-waiving statistics, self-righteousness, overly deterministic design methods, isolated ‘green’ demonstration projects, environmental eschatology, and/or misplaced moralities. Practice will clearly change in this century. Therefore, the aim here is to integrate these best theories and practices directly into the content of this building systems course and thus into practice, without the dramatic hand-waiving litany. It makes more sense to directly integrate sustainable practices rather than differentiating them from presumably unsustainable, yet taught practices. This course is focused on Architecture and Energy Systems that incorporate intelligent practices, including principles of sustainability. Sustainability is a definite pretext of the course, but only as a pretext for intelligent practice in the twenty-first century. Practice smarter and deeper.
Course Requirements

There are six requirements for this course:

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<thead>
<tr>
<th>Requirement</th>
<th>% of Grade</th>
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<tr>
<td>Attendance and participation</td>
<td>10%</td>
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<tr>
<td>Reading responses</td>
<td>15%</td>
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<tr>
<td>Public Service Project</td>
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<td>Design projects</td>
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<tr>
<td>Final project</td>
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<td>Final exam</td>
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Public Service Project:

The material in this course is useful and valuable. Groups of students will be required to research and develop video presentations that should teach the public about how design ideas relating to environmental systems can improve their quality of life. Students will broadcast these videos on the internet using the website youtube.

Reading Responses

The students are required to produce a Reading Response for each piece of text that is assigned. The responses should critically engage the material and demonstrate a deep understanding of the key concepts and principles. These responses should be between 300 and 500 words in length.

Design Projects

A series of short design related projects will require students to produce architectural deliverables that demonstrate their understanding of building science.

Final Project

The design project is intended to challenge the students to apply the concepts and theories presented in the both the lectures and readings. Students will be required to design a single family house for a particular climate profile.

Final Exam:

There will be exams on the content of the lectures and readings. The exam will focus on key vocabulary, concepts, and principles from the lectures. Expect to answer theoretical questions in essay form, diagram various energy principles and flows, define terms, and be responsible for any content in the readings and lectures.

Grades:

A: Superior work. True Excellence. Students work is original and of exceptional intellectual quality, is very well written, represented, and complete. The graphics, documentation, and text reveal original thinking. All work is supported by wide textual documentation, is structurally inventive, and is thorough and complete.

B: Good work. Students work is of high intellectual quality, is well written, is supported by textual documentation, progresses logically, and is complete.

C: Average work. Meets the requirements. Students work is of average intellectual quality, is intelligible, is supported by some textual documentation, progresses logically, and is complete.

D: Students work is of below average intellectual quality, is written poorly, is not adequately supported by textual documentation, progresses illogically, and/or is incomplete.

F: Students work is of unacceptable intellectual quality, badly written, unsupported, illogical, and/or incomplete.

For more detail refer to [http://www.architecture.neu.edu/student_resources/grading_policy/studio_course](http://www.architecture.neu.edu/student_resources/grading_policy/studio_course)

Academic Honesty

Northeastern University is committed to the principles of intellectual honesty and integrity. All members of the Northeastern community are expected to maintain complete honesty in all academic work, presenting only that which is their own work in tests and assignments. If you have any questions regarding proper attribution of the work of others, contact your professor prior to submitting work for evaluation.

For more detail refer to [http://www.osccr.neu.edu/policy.html](http://www.osccr.neu.edu/policy.html)
Design Project:

Full set first draft Due 4-16-2010
Final Construction Drawings Due 4-29-2010

Students will be required to produce a complete set of construction drawings for a single family home no larger than 1800 sf. The primary goal of this design project is to produce construction documents for affordable and energy efficient homes. Students can work in groups of up to four people and should select two different climate zones to site their designs in.

Deliverables:
- Well formatted and “clean” AutoCAD/revit file/dwg file
- Printed set of drawings at an appropriate scales with proper line weights
- A digital pdf file of the complete drawing set
- Drawings should be formatted for one of the following paper sizes: 11”x17”, 18” by 24”, 24” by 36”, 36” by 36”, or 36” by 48”

Minimum drawing list:
- Cover page
- General notes page
- Elevations
- Plans: including electrical, lighting, foundation, roof, framing, schematic HVAC information
- Details: climate specific options for foundation, wall sections, windows, and roof
- 1 misc. page of: critical design features, interior elevations, or sectional drawings etc.

Suggested resources:

Grading criteria:

The drawings will be evaluated by several of design and construction professionals. The main focus of the evaluation will be determining if the deliverables are ready to be given to a contractor to initiate bidding and construction. The goal of this project is to produce representation that is ready for construction. If there is insufficient information to initiate construction then the project is not complete.

Completed projects will be graded according to:
- Professional process: both stages submitted on time and in a complete manner
- Professional appearance: proper line weights and scales
- Accuracy: correctly designed and annotated building details that demonstrate an understanding of building science
- Clarity: the information thoughtfully formatted and clearly presented
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Design Projects:

1. Research  Due 1-26-2010

During the course of this semester students will be required to design a single family home no larger than 1600 sf. The primary goal of this design project is to produce construction documents for affordable and ecologically efficient homes. Students can work in groups of up to four people and should select two different climate zones to site their designs in. Before students begin their designs they will first be asked to do a little research.

Deliverables:

- Burned on a CD or DVD: a pdf or power point presentation of the following:
  - 3 different house precedents that contain design concepts that the group finds interesting and wishes to explore in their own project.
  - 3 typical house precedents that contain design concepts that the group thinks are wasteful and want to avoid.
  - 3 different “green” concepts or features that the group is interested in using
  - 1 commonly used “green” feature that the group thinks is kind of stupid
  - A bullet point summery of the design concepts/ideas/features to be included and excluded

- Printed and stapled version of the presentation

Presentation:

- Students will be called at random to present their research to the class in a precise and professional manner.

Suggested resources:

- http://www.trendir.com/house-design/
- http://www.contemporist.com/category/architecture/
- http://www.inhabitat.com/
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Design Projects:

2. Floor plans and elevation          Due 2-5-10

Students will be required to draw floor plans and elevations of a single family home no larger than 1600 sf. The primary goal of this design project is to produce construction documents for affordable and energy efficient homes. Students can work in groups of up to four people and should select two different climate zones to site their designs in.

Deliverables:

- Well formatted and “clean” .dwg/AutoCAD/revit file
- Printed drawings at an appropriate scale with proper line weights

Presentation:

- Students will be required to explain their key design concepts and how their design incorporates them

Suggested resources:

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Design Projects:

3. Climate profile.   Due 2-19-2010

Students will be required to create a digital file of a psychrometric chart and then plot month by month climate data onto the chart. There should be 1 chart for each of the 2 climate zones selected. These charts should be printed in color on 8.5” by 11” paper and also include a month by month description of the conditioning challenge presented. Please indicate the source of the climate data on the page.

Deliverables:

- Well formatted and “clean” Adobe file (illustrator or photoshop)
- A pdf version of the chart submitted digitally
- Printed copy of each chart

Suggested resources:

- Your text book
Design Projects:

4. Wall design. Due 2-26-2010

Students will be required to draw residential wall section details for two distinctly different climates. At least one of the sections should include a window. Both horizontal and vertical sections through the wall assembly should be drawn. These drawings should be properly annotated and of professional quality.

Deliverables:

- Well formatted and “clean” AutoCAD file
- Printed drawings at an appropriate scale with proper line weights

Presentation:

- Students will be required to explain the necessity of each component in the drawing.

Suggested resources:

- www.BuildingScience.com
- www.FreeGreen.com
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Design Projects:

5. Roof design. Due 3-4-2010

Students will be required to draw residential roof section details for two distinctly different climates. These drawings should be properly annotated and of professional quality.

Deliverables:

• Well formatted and “clean” AutoCAD file

• Printed drawings at an appropriate scale with proper line weights

Presentation:

• Students will be required to explain the necessity of each component in the drawing.

Suggested resources:

• www.BuildingScience.com
• www.FreeGreen.com
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Design Projects:

6. Passive systems design.  Due 3-11-2010

Students will be required to revise their house designs to include passive solar design concepts. A series of sectional diagrams should be produced for each of the climates zones. Human operated movable devices that reflect shade or insulate should be considered as passive concepts. Use these concepts to make your designs better not just greener.

Deliverables:

- Updated plans and elevations with the design changes clearly labeled
- Sectional diagrams with accurate solar angles.
- Written description of how and when these designs ideas will be beneficial. Describe when these design concepts contribute a benefit as well as whatever construction or efficiency liabilities may come with them.

Presentation:

- Students will be required to explain how their passive concepts cause more good than harm
Public Service Project:

3. Public Service Announcement: web video

Students will be required to produce and post a public service announcement video on youtube. The video should take a concept about sustainability and instruct viewers how it can be implemented in their home.

Deliverables:

- An educational video posted on youtube that demonstrates the ability to explain concepts learned in the course.
- A list of keywords that will help the audience find the video

Extra Credit: go viral

- The 5 videos that are viewed the most will get an considerable amount of extra credit.