ARC/ID 481 001
Environmental Design II: Energy and Systems
3 credits
Fall 2016
Monday 6:00pm – 8:50pm
Quigley 140B

Shannon Sanders McDonald, AIA
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Telephone: Office 453-1126 (for emergencies only 303-618-6449)
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Office hours: M, T, W, Th, F 10:00 - 11:00 and 2:00 - 3:00 or by appointment (please E-mail)

From the ARC Program Master Syllabus

Course no., hours, and title: ARC/ID 481 001 Environmental Design II: Energy and Systems: 3 credits

Course Description

481-3 Environmental Design II: Energy and Systems.
(Same as ARC 583, ID 481) The study of the influence of energy, human comfort, climate, context, heating, cooling and water on the design of buildings and sites. The design of passive and active environmental systems and strategies for sustainability. Not for graduate credit.

Course Objectives

Upon completion of this course, the student will be able to:

1. Develop an understanding of global climate and resources in relationship to the design of individual buildings and site and be introduced to the principals of sustainable design with emphasis on indigenous architecture.
2. Develop an understanding of the basic principles of ecology and responsibilities with respect to environmental and resource conservation in architecture and urban design.
3. Develop an understanding of parallel and divergent canons and traditions of architecture, landscape and urban design including examples of indigenous, vernacular, local, regional, national settings from the Eastern, Western, Northern, and Southern hemispheres in terms of their climatic, ecological, technological, socioeconomic, public health, and cultural factors.
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4. Develop an understanding of the role of applied research in determining function, form, and systems and their impact on human conditions and behavior.
5. Develop the ABILITY to gather, assess, record, apply and comparatively evaluate environmental Information within architectural coursework and design processes.
6. Develop an ABILITY to determine the climate, human comfort, and design strategies for cooling and heating on a specific site.
7. Develop an ABILITY with sites and resources with emphases on solar access, wind, and air, rain, groundwater and vegetation.
8. Develop an ABILITY in the area of the principles of heat flow and basic principles that Inform the design of building envelope systems.
9. Develop an ABILITY with design strategies for heating and cooling with respect to zoning, daylighting, passive solar heating, passive cooling, heat loss, heat gain, and applied psychometry.
10. Develop an understanding of HVAC systems for small and large buildings with emphases on healthy environments.
11. Develop an understanding of the use of computer programs to represent and analyze building performance.
12. Develop an understanding of water and water basics, storm water, water supply, water and waste, and solid waste.
13. Develop an understanding of basic plumbing principals and the ability to layout systems.
14. Develop an understanding of fire protection and suppression systems.
15. Develop an understanding of building signal systems, automation and transportation within buildings.

Topical Outline

<table>
<thead>
<tr>
<th>Topics</th>
<th>Percentages of Time (Estimated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Context for Building Systems Design</td>
<td>5%</td>
</tr>
<tr>
<td>A. World Resources</td>
<td></td>
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<tr>
<td>B. Sustainable Design Principals</td>
<td></td>
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<tr>
<td>II. Climate, Comfort, and Design Strategies</td>
<td>5%</td>
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<tr>
<td>A. Comfort</td>
<td></td>
</tr>
<tr>
<td>B. Climate</td>
<td></td>
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<tr>
<td>C. Design Strategies</td>
<td></td>
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<tr>
<td>III. Site and Resources</td>
<td>5%</td>
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<tr>
<td>A. Solar Access</td>
<td></td>
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<tr>
<td>B. Wind and Air</td>
<td></td>
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<tr>
<td>C. Rain and groundwater</td>
<td></td>
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<tr>
<td>D. Vegetation</td>
<td></td>
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<tr>
<td>IV. Heat Flow</td>
<td>10%</td>
</tr>
<tr>
<td>A. Building Envelope</td>
<td></td>
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<tr>
<td>B. Heat Flow Analysis</td>
<td></td>
</tr>
<tr>
<td>C. Moisture and infiltration</td>
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</tbody>
</table>
V. Designing for Heating and Cooling 20%
   A. Zoning and Daylighting
   B. Passive Solar heating
   C. Passive Cooling
   D. Heating and cooling load calculations
   E. Applied Psychometry

VI. HVAC Systems for Buildings 20%
   A. Typical design process
   B. Control Systems
   C. Heating-Cooling Systems
   D. Psychometrics and refrigeration
   E. Introduction to Energy Modeling

VII. Water and Waste Systems 20%
   A. Water, storm water and water basics
   B. Water supply
   C. Water and waste
   D. Solid Waste

VIII. Fire Protection 10%
   A. Alarm Systems
   B. Suppression Systems

IX. Signal, Automation 2.5%

X. Movement Systems 2.5%

NAAB Student Performance Criteria
The accredited degree program must demonstrate that each graduate possesses the knowledge and skills defined by the criteria below. The knowledge and skills defined here represent those required to prepare graduates for the path to internship, examination, and licensure and to engage in related fields. The program must provide student work as evidence that its graduates have satisfied each criterion.

The criteria encompass two levels of accomplishment:

- **Understanding**—The capacity to classify, compare, summarize, explain, and/or interpret information.

- **Ability**—Proficiency in using specific information to accomplish a task, correctly selecting the appropriate information, and accurately applying it to the solution of a specific problem, while also distinguishing the effects of its implementation.

II.1.1 Student Performance Criteria (SPC): The NAAB establishes SPC to help accredited degree programs prepare students for the profession while encouraging education practices suited to the individual degree program. The SPC are organized into realms to more easily understand the relationships between each criterion.
NAAB Student Performance Criteria Fulfilled:

Realm B: Building Practices, Technical Skills, and Knowledge. Graduates from NAAB-accredited programs must be able to comprehend the technical aspects of design, systems, and materials and be able to apply that comprehension to architectural solutions. In addition, the impact of such decisions on the environment must be well considered.

Student learning aspirations for this realm include
- Creating building designs with well-integrated systems.
- Comprehending constructability.
- Integrating the principles of environmental stewardship.
- Conveying technical information accurately

The accredited degree program must demonstrate that each graduate possesses skills in the following areas:

B.2 Site Design: Ability to respond to site characteristics, including urban context and developmental patterning, historical fabric, soil, topography, ecology, climate, and building orientation, in the development of a project design.

B.6 Environmental Systems: Ability to demonstrate the principles of environmental systems’ design, how design criteria can vary by geographic region, and the tools used for performance assessment. This demonstration must include active and passive heating and cooling, solar geometry, daylighting, natural ventilation, indoor air quality, solar systems, lighting systems, and acoustics.

B.7 Building Envelope Systems and Assemblies: Understanding of the basic principles involved in the appropriate selection and application of building envelope systems relative to fundamental performance, aesthetics, moisture transfer, durability, and energy and material resources.

B.9 Building Service Systems: Understanding of the basic principles and appropriate application and performance of building service systems, including lighting, mechanical, plumbing, electrical, communication, vertical transportation, security, and fire protection systems.

Realm C: Integrated Architectural Solutions. Graduates from NAAB-accredited programs must be able to demonstrate that they have the ability to synthesize a wide range of variables into an integrated design solution.

Student learning aspirations for this realm include
- Comprehending the importance of research pursuits to inform the design process.
- Evaluating options and reconciling the implications of design decisions across systems and scales.
- Synthesizing variables from diverse and complex systems into an integrated architectural solution.
- Responding to environmental stewardship goals across multiple systems for an integrated solution.

The accredited degree program must demonstrate that each graduate possesses skills in the following areas:

C.1 Research: Understanding of the theoretical and applied research methodologies and practices used during the design process.

CIDA Standards:
Standard #2: Global Context for Design
   a. the concepts, principals and theories of sustainability as they pertain to building method, materials, systems, and occupants

Standard #4: Design Process
   g. exposure to a range of design research and problem solving methods

Standard #12: Environmental Systems and Controls
   e. the principles of thermal design
   f. how thermal systems impact interior design solutions
   g. the principles of indoor air quality
   h. how the selection and application of products and systems impact indoor air quality

Standard #13: Interior Construction and Building Systems
   c. distribution systems including power, mechanical, HVAC, data/voice, telecommunications, and plumbing
   d. energy, security, and building control systems
   f. vertical circulation systems

Standard #14: Regulations
   a. sustainability guidelines
   f. suppression: devices used to extinguish flames including sprinklers, standpipes, fire hose cabinets, extinguishers, etc.

TEXTBOOKS:

Required: (one digital copy of the Grondzik book is on reserve at Main library)


Supplemental Reading

Also check the new E-books for rent as some of the newer books are available in this format. Many other excellent books are available in this area so explore, learn and share.

Introduction

Many forces at work in the environment affect the form and order of a building, community, or a region within a city or community. A complex set of forces will determine the character of the building, what it looks like, how it feels. It could be argued that the building is not anything more or less than the sum of the forces that act on it and their relationship to human comfort, interpreted through the heart and mind of the architect.

This semester we will be studying, from various perspectives, the forces at work in the environment that create architectural order, design strategies and drive the principles of building design with a focus on energy and systems.

Class Calendar - Fall 2016

August 22
Assignment 1 – In Class

**Homework:**
Lecture One - Context for Building Systems Design
(Read Text 1: pages 1-59)
Lecture Two - Climate, Comfort, and Design Strategies
(Read Text 1: pages 109-127)
(Read Text 2)
(post your pic on desire 2 learn)

August 29
Quiz One
Discuss TEXT 2- In Class
Assignment 2 – In Class

**Homework:**
Lecture Three - Site and Resources
(Read Text 1: pages 61-105)
Lecture Four - Indoor Air Quality
(Read Text 1 pages 129-165)
September 05  Labor Day - holiday

12  Assignment 3 – In Class  
   **Homework:**
   Lecture Five - Designing for Passive Heating and Cooling  
   *(Read Text 1: pages 295-335)*
   Lecture Six - Designing for Passive Heating and Cooling  
   *(Read Text 1: pages 337-420)*

19  *I WILL BE IN ANTWERP, BELGIUM SO THIS CLASS WILL BE ALL ONLINE*
   Quiz Two
   Assignment 4  
   **Homework:**
   Lecture Seven - Solar Strategies, Heat Flow  
   *(Read Text 1: pages 167-191)*
   Lecture Eight - Heat Flow  
   *(Read Text 1: pages 193-238)*

26  Assignment 5 – In Class  
   **Homework:**
   Lecture Nine - Designing for Active Heating and Cooling  
   *(Read Text 1: pages 1383-1405)*
   Lecture Ten - Designing for Active Heating and Cooling  
   *(Read Text 1: pages 421-494)*

October 03  Quiz Three  
   Assignment 6 – In Class  
   **Homework:**
   Lecture Eleven - HVAC Systems for Buildings  
   *(Read Text 1: pages 421-494)*
   Lecture Twelve - HVAC Systems for Buildings  
   *(Read Text 1: pages 421-494)*

10  Fall Break – holiday

17  **MIDTERM**  
   **Homework:**
   Lecture Thirteen - HVAC Systems for Buildings  
   *(Read Text 1: pages 494-581)*
   Lecture Fourteen - HVAC Systems for Buildings  
   *(Read Text 1: pages 494-581)*

24  Quiz Four  
   Assignment 7 – In Class  
   **Homework:**
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Lecture Fifteen - HVAC Systems for Buildings
(Read Text 1: pages 494-581)
Lecture Sixteen - HVAC Systems for Buildings
(Read Text 1: pages 494-581)

30 Last Day to Drop – see syllabus attachment

31 Assignment 8 – In Class
Homework:
Lecture Seventeen - Water and Waste
(Read Text 1: pages 793-1012)
Lecture Eighteen - Water and Waste Systems
(Read Text 1: pages 793-1012)

November 07 Quiz Five
Assignment 9 – In Class
Homework:
Lecture Nineteen - Water and Waste Systems
(Read Text 1: pages 793-1012)
Lecture Twenty - Water and Waste Systems
(Read Text 1: pages 793-1012)

14 Assignment 10 – In Class
Homework:
Lecture Twenty One - Water and Waste Systems
(Read Text 1: pages 793-1012)
Lecture Twenty Two - Fire Protection
(Read Text 1: pages 1139-1216)

21 Quiz Six
Assignment 11 – In Class
Homework:
Lecture Twenty Three - Fire Protection
(Read Text 1: pages 1139-1216)
Lecture Twenty Four - Fire Protection
(Read Text 1: pages 1139-1216)

28 Assignment 12 – In Class
Homework:
Lecture Twenty Five - Signal, Automation and Movement Systems
(Read Text 1: pages 1407-1553)
Lecture Twenty Six - Signal, Automation and Movement Systems
(Read Text 1: pages 1407-1553)

December 05 Lecture Twenty Seven - REVIEW SESSION
12 COMPREHENSIVE FINAL 5:00-7:00pm
This calendar is subject to change. Please check any dates and schedules with the course instructor. This calendar is intended to provide for coordination of due dates for design projects, papers, assignments, tests, lectures and other activities central to the life of the students in our Architecture/Interior programs. Our collective adherence to it will provide the highest and best educational opportunities for our students by allowing focus and reducing unnecessary conflict in schedules. We have a D2L (desire2 learn) site for this class where all documents will be posted and student participation in submitting found information or web sites that relate to our topic is encouraged. Note: Please review the schedule and due dates carefully. We, all of the faculty have tried to coordinate due dates for projects and exams. The process is not perfect, but it is sensitive to the requirements and demands of being a design student. You may find that there are times when projects or tests are closely packed...make sure you look ahead and plan accordingly.

Flipped Classroom:

This will be a flipped classroom, where you view the lectures as your homework assignments, they will be discussed in the next class, and assignments/quizzes/exams will be given in class. D2L will be used to view all lectures and you will be graded for you actually viewing them!

Lectures:

Lectures were taped last fall and may contain some non-content information not applicable to this class. Each lecture will have a separate power point that has this type of information removed, but all the content remains the same!

Assignments:

Assignments will be due at the end of each class unless noted on each assignment or changed by the professor. We will experiment with ECHO 360 as well in this class. This will be a paper free class as much as possible! Please follow all submittal requirements especially how you label your documents!

Grading Policy/Scale

There will be many assignments and small graded quizzes during the semester that will also contribute toward your grade along with midterm and final. I have provided the expected total points, although this can change during the semester and it will be updated on Desire2Learn. The percentage for each category will remain the same. The breakdown of grades is as follows:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viewing Lectures</td>
<td>15%</td>
<td>260</td>
</tr>
<tr>
<td>Assignments</td>
<td>15%</td>
<td>240</td>
</tr>
<tr>
<td>Quizzes</td>
<td>20%</td>
<td>150</td>
</tr>
<tr>
<td>Midterm</td>
<td>20%</td>
<td>50</td>
</tr>
<tr>
<td>Final</td>
<td>30%</td>
<td>150</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>700</strong></td>
</tr>
</tbody>
</table>
SCALE

90-100  A
80-89   B
70-79   C
60-69   D
59 or less  F

We have a desire2 learn site for this class where all documents will be posted and student participation in submitting found information or web sites that relate to our topic is encouraged. Desire 2 learn will be used for submitting assignments, due dates are the end of class period or noted in the assignment/identified by the professor in class. This will be a paper free class as much as possible! Please follow all submittal requirements. Those who meet all deadlines and have perfect attendance will be given consideration if their grade is on the cusp between grades – working hard helps!!

Assignments and Deadline Policy

Assignments in this class verify from reading and critically responding to analysis of buildings and parts of buildings, how environmental systems work. In the fields of interior design and architecture we live and die by deadlines. As part of a professional course of study, this course will be no different. The deadlines stated on the specific assignments are not flexible, unless changed by me. If assignments are not turned in as specified, the student will receive a zero for that particular exercise unless an approved absence. An assignment is considered late if it is not complete and submitted at the submission date and time. Continuing to work on a project after the review process has begun will also result in a failing grade of “F”. All of that being stated – you should always turn in your assignments even if late, as this fall semester is a busy and unique one for every student and you learning the material is the most important aspect.

Quizzes, Tests (midterm and final)

Quizzes and tests must be taken in class, unless you have an excused absence or have online status. No make-ups or retests will be given for not making it to class without documentation for an excused absence.

Attendance Policy

Attendance is mandatory during the entire scheduled class time. After you choose your seat for the semester, attendance is determined by that seat, if the seat is empty you are absent. **If you are late to class, after 6:00pm you will need to sit in the back row where your attendance will be taken. If you are later than 6:05pm you will be marked late. You may have 1 legal absences (without notifying me or telling me why). You can view the missed lecture posted in D2L. (2DL documents your participation)**

You are required to notify your instructor of any personal emergencies or other disruptions to your ability to attend class. Grading for attendance will be as follows: 1 unexcused absence will reduce your final semester grade by one letter grade. Two (2) late or leaving early (being late to class or leaving early without approved absence) constitute one (1) unexcused absence. More than 2 unexcused absences
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will result in an “F” for your semester grade. An approved absence will require a doctor’s note, police report, or other form of official documentation such as a photo delivered to me promptly. You are entitled to 1 absence without notifying me.

Library
Your librarian, Sarah Prindle, is your lifeline for research assistance and development. Her office hours are Mondays 2:00-5:00pm at the Morris Library Information Desk, and Fridays 10:00am-1:00pm in her office (Morris Library 260C). You can contact her anytime with questions or for an appointment at sprindle@lib.siu.edu or 618-453-1249.

Plagiarism and Student Conduct Codes
Any act of plagiarism will result in automatic failure of the class and may result in dismissal from the program per university policy on such offenses. Any reference material used in assignments must be sourced properly. It is each student’s responsibility to know and comply with the SIUC Student Conduct Code and the policies in the Architecture Student Handbook.

Classroom Etiquette
No cell phone use during class unless required as part of required class interaction. No electronic devices during quizzes or exams unless stated allowed for that specific quiz or exam.

Special Needs
If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with Disability Support Services (DSS) to help us determine appropriate academic accommodations. DSS (618,453.5738; http://disabilityservices.siu.edu/) typically recommends accommodations through a verification form provided to the student. Any information you provide is private and confidential and will be treated as such.

Quigley Hall Emergency Response Procedures

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings in Quigley Hall and elsewhere on campus, available on the BERT’s website at www.bert.siu.edu, Department of Public Safety’s website www.dps.siu.edu (disaster drop down) and in the Emergency Response Guidelines pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency. The Building Emergency Response
Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.

If an evacuation of Quigley Hall is required during an emergency, ALL School of Architecture students, faculty, and staff (from all three programs) are to gather ASAP after exiting in the grassed area east of the Quigley Courtyard and covered walkway area to determine if there are people unaccounted for at that particular time. There are four SoA faculty members that are part of the SIUC Quigley Hall BERT Team who will be facilitating the necessary emergency procedures. There are BERT Posters located in numerous public areas throughout Quigley with Quigley Team emergency phone numbers.

**Do not hesitate to call 911** if you have any sense of emergency and there isn’t a faculty or staff person available to immediately assist – There are highly qualified and prepared professionals to make a response decision and to give you advice over the phone.

**QUIGLEY HALL EMERGENCY RESPONSE MEETING AREAS**

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>AREA</th>
<th>LOCATION</th>
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<tbody>
<tr>
<td>Food and Nutrition</td>
<td>1</td>
<td>Woody Hall grassed area West of Quigley Main Entry</td>
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<tr>
<td>Child Development Laboratory</td>
<td>2</td>
<td>North Side Quigley beyond Fenced Area</td>
</tr>
<tr>
<td>Social Work</td>
<td>3</td>
<td>Grassed Area NE of Loading Dock and Auditorium</td>
</tr>
<tr>
<td><strong>School of Architecture</strong></td>
<td><strong>4</strong></td>
<td><strong>Grassed Area East of Quigley Patio and the Covered Walkway</strong></td>
</tr>
<tr>
<td>College of Education - Pre-School</td>
<td>5</td>
<td>Grassed Walkways Area beyond South Entry</td>
</tr>
<tr>
<td>General Classrooms &amp; Auditorium</td>
<td>1, 3, &amp; 4</td>
<td>Please instruct those outside faculty, students, and visitors during an emergency</td>
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</tbody>
</table>
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SIU Southern Illinois University
CARBONDALE

Syllabus Attachment
Fall 2016

SAFETY AWARENESS FACTS AND EDUCATION

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Facts and Education

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