ARC/ID 481 001
Environmental Design II: Energy and Systems
3 credits
Fall 2015
T/TH 11:00am – 12:15pm
Quigley 140B

Shannon Sanders McDonald, AIA
Office: 137 Quigley
Telephone: Office 453-1126 (for emergencies only 303-618-6449)
Email: smcdonald@siu.edu – best way to contact me
Office hours: Monday, Wednesday and Friday: 11:00am – Noon
Tuesday and Thursday: 1:30pm - 4:00 pm
and by appointment

TA – Hanan Rawashdeh
Masters Studio – hananrawa91@siu.edu
Office hours – At her desk in the masters studio: Tuesday 8:30am -10:30am or by apt.

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.
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 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 psychrometry.
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>
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</thead>
<tbody>
<tr>
<td>I. Context for Building Systems Design</td>
<td>5%</td>
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<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>
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<tr>
<td>B. Climate</td>
<td></td>
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<tr>
<td>C. Design Strategies</td>
<td></td>
</tr>
<tr>
<td>III. Site and Resources</td>
<td>5%</td>
</tr>
<tr>
<td>A. Solar Access</td>
<td></td>
</tr>
</tbody>
</table>
B. Wind and Air
C. Rain and groundwater
D. Vegetation

IV. Heat Flow 10%
A. Building Envelope
B. Heat Flow Analysis
C. Moisture and infiltration

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 psychrometry

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, ect.

**TEXTBOOKS:**

Required: (one copy of the Grondzik book will be on reserve at Main library)

Supplemental Reading (a copy of many of these will also be on reserve in Architecture library)
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.
**Environmental Design II: Energy and Systems**  
**Fall 2015 – Assistant Professor Shannon Sanders McDonald**

**Class Calendar - FALL 2015**

*This calendar is subject to change. Please check any dates and schedules with your 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. D2L will be used for submitting assignments *and the due date is noted on the schedule below and on each assignment.* D2L may be able to integrate the I-clicker points this semester – we will see what occurs. This will be a paper free class as much as possible! Please follow all submittal requirements *especially how you label your documents!*

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.

**Class Calendar - Fall 2015**

**August**

25  Context for Building Systems Design  
(post your pic on desire 2 learn)(register I-clicker)

27  Climate, Comfort, and Design Strategies  
(Read Text 1: pages 1-59 and 109-127) (register I-clicker)

**September**

01  Site and Resources, must have I-clicker registered on d2L site, *Discuss TEXT 2, Assignment 1 due*  
(Read Text 1: pages 61-105)

03  Indoor Air Quality, *QUIZ 1*  
(Read Text 1 pages 129-165)

07  Labor Day - holiday

08  Designing for Passive Heating and Cooling, *no class due to Travel week* – (online lecture will be posted on D2L, as Travel Week and many of us will be travelling)  
(Read Text 1: pages 295-335)

10  Designing for Passive Heating and Cooling, *Assignment 2 due, no class due to Travel week* – (online lecture will be posted on D2L, as Travel Week and many of us will be travelling)  
(Read Text 1: pages 337-420)

15  Active Solar Strategies, *Guest speaker: Aur Beck*  
(https://enlighten.enphaseenergy.com/public_systems)  
Track the use of solar on Professor Dobbins house:  
https://enlighten.enphaseenergy.com/pv/public_systems/c4Hw685960?preview=1  
(Read Text 1: pages 167-191)


Environmental Design II: Energy and Systems  
Fall 2015 – Assistant Professor Shannon Sanders McDonald

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>17</td>
<td>Solar Strategies, Heat Flow, <strong>Quiz 2</strong></td>
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<tr>
<td></td>
<td><em>(Read Text 1: pages 193-138)</em></td>
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<tr>
<td>22</td>
<td>Heat Flow</td>
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<tr>
<td>24</td>
<td>Designing for Active Heating and Cooling, <strong>Assignment 3 due</strong></td>
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<tr>
<td></td>
<td><em>(Read Text 1: pages 421-494)</em></td>
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<tr>
<td>29</td>
<td>Designing for Active Heating and Cooling</td>
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**October**

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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>01</td>
<td>HVAC Systems for Buildings, <strong>Quiz 3</strong></td>
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<tr>
<td></td>
<td><em>(Reading Text 1: pages 421-494)</em></td>
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<tr>
<td>06</td>
<td>HVAC Systems for Buildings</td>
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<tr>
<td>08</td>
<td><strong>MIDTERM EXAM</strong></td>
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<tr>
<td>10-13</td>
<td><strong>Fall Break</strong></td>
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<tr>
<td>15</td>
<td>HVAC Systems for Buildings, <strong>Assignment 4 due</strong></td>
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<tr>
<td></td>
<td><em>(Reading Text 1: pages 494-581)</em></td>
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<tr>
<td>20</td>
<td>HVAC Systems for Buildings</td>
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<tr>
<td>22</td>
<td>HVAC Systems for Buildings, <strong>Quiz 4</strong></td>
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<tr>
<td></td>
<td><em>(Reading Text 1: pages 494-581)</em></td>
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<tr>
<td>27</td>
<td>HVAC Systems for Buildings – lecture online, Professor McDonald at AASHE conference</td>
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<tr>
<td>29</td>
<td>Energy Modeling, <strong>Assignment 5 due</strong></td>
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**November**

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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>03</td>
<td>Water and Waste</td>
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<tr>
<td></td>
<td><em>(Reading Text 1: pages 793-1012)</em></td>
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<tr>
<td>05</td>
<td>Water and Waste Systems, lecture online, <strong>Quiz 5 in class</strong></td>
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<td></td>
<td>(Professor McDonald at PodCar)</td>
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<tr>
<td>10</td>
<td>Water and Waste Systems</td>
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<tr>
<td></td>
<td><em>(Reading Text 1: pages 793-1012)</em></td>
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<tr>
<td>11</td>
<td><strong>Holiday</strong></td>
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<tr>
<td>12</td>
<td>Water and Waste Systems, <strong>Assignment 6 due</strong></td>
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<tr>
<td>17</td>
<td>Water and Waste Systems</td>
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<td></td>
<td><em>(Reading Text 1: pages 793-1012)</em></td>
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<tr>
<td>19</td>
<td>Fire Protection, <strong>Quiz 6</strong></td>
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<tr>
<td>24</td>
<td>Fire Protection, <strong>Assignment 7 due</strong></td>
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<tr>
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<td><em>(Reading Text 1: pages 1139-1216)</em></td>
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<tr>
<td>25-29</td>
<td><strong>Thanksgiving</strong></td>
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**December**

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<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>01</td>
<td>Fire Protection</td>
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<tr>
<td>03</td>
<td>Signal, Automation and Movement Systems, <strong>Quiz 7</strong></td>
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<tr>
<td></td>
<td><em>(Reading Text 1: pages 1409-1553)</em></td>
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<tr>
<td>08</td>
<td>Signal, Automation and Movement Systems</td>
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<tr>
<td>10</td>
<td>Review session</td>
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<tr>
<td>17</td>
<td><strong>COMPREHENSIVE FINAL 12:30pm – 2:30pm – same room</strong></td>
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<tr>
<td>14-18</td>
<td><strong>EXAM WEEK</strong></td>
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**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 these will be based on the lectures and readings. 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>Category</th>
<th>Percentage</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>Participation/I-clicker</td>
<td>5%</td>
<td>150</td>
</tr>
<tr>
<td>Assignments</td>
<td>15%</td>
<td>175</td>
</tr>
<tr>
<td>Quizzes</td>
<td>25%</td>
<td>175</td>
</tr>
<tr>
<td>Midterm</td>
<td>25%</td>
<td>50</td>
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<tr>
<td>Final</td>
<td>30%</td>
<td>150</td>
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<tr>
<td><strong>100%</strong></td>
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<td><strong>700</strong></td>
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**SCALE**

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

*We have a desire2learn 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 listed in the calendar and noted in the assignment. **Desire 2 Learn should integrate the I-clicker points this semester** (see instructions at the end of the syllabus). 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 your 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. 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 pick 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 11:00am you will need to sit in the back row where your attendance will be taken. If you are later than 11:05am you will be marked late. You may have 2 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: three (3) unexcused absences 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 6 unexcused absences 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 2 absences without notifying me.

Library
Your librarian, Sarah Prindle, is your lifeline for research assistance and development. Her office hours are Wednesdays 1:00-4:00pm, 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. Using someone else’s I-clicker fits into an offense in this category.

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. The I-clicker will be used to assist with classroom participation. It can also assist with any issues that may arise. **Please register your I-clicker on D2L by September 01, 2015. It is privacy protected. Directions are posted at the end of this syllabus.**

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/](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.

**Directions for STUDENTS to register their I-clicker remotes:**
1. Log into D2L and select your course.
2. Once on your Course Home page, locate the I-clicker Registration link in content browser.
3. Click the I-clicker registration link.
4. Register your I-clicker remote by entering your I-clicker remote ID#. Your remote is now registered. You can remove your remote registrations from Desire2Learn at any time by clicking **Remove** on the I-clicker remote registration page.

**To use and register any smart device:**
Choose to use your smartphone, tablet or laptop as your response device. You can use REEF Polling through your Web browser or download our iOS app from the iTunes App Store. Be on the lookout for our Android app that’s coming soon!

Create a REEF account on https://www1.iclicker.com/, find your institution, search for your instructor and add a course! From there, just join a session to view questions and presentation images right on your device and begin participating in class.

Other relevant facts for students about registration:
- Even if students are using i>clicker for more than one course, they only need to register their clickers in one course. Their registration data will automatically be applied to all of their other Desire2Learn courses using i>clicker.
- Students can share clickers with a friend/roommate as long as they are not using i>clicker in the same courses.
- Students can register more than one clicker in Desire2Learn. If, for example, students break a clicker, they can register additional clickers through the same tool and all of their registered clickers (and their votes) will be tied to their Desire2Learn ID.
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.

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<thead>
<tr>
<th>QUIGLEY HALL EMERGENCY RESPONSE MEETING AREAS</th>
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<tbody>
<tr>
<td><strong>PROGRAM</strong></td>
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<tr>
<td>Food and Nutrition</td>
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<td>Child Development Laboratory</td>
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<tr>
<td>Social Work</td>
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<tr>
<td>School of Architecture</td>
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<tr>
<td>College of Education - Pre-School</td>
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<tr>
<td>General Classrooms &amp; Auditorium</td>
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