ARPL 537 Sustainable Design Strategies and Synergies

Note: this course satisfies the requirements of the two former courses:
ARPL 533 LEED©[ing] Green; Sustainable Synergies in Building Assessment
ARPL 733: Sustainable Design Strategies

Fall 2013
Undergraduate and Graduate Syllabus

Credit Hours
3

Prerequisites/ Department consent
Architecture 358 Environmental Systems
Arch 301 Architectural Design I
Permission from Department Director at The Catholic University of America School of Architecture

Classroom
Gibbons B031

Days and hours of class meetings and labs or discussion sections
M 6:40PM - 9:10PM

Instructor contact information:
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Please note that this is a reduced syllabus formatted to give prospective students an indication of course content only. Content may change in final version issued to students registered for the course.
Course Description (from Cardinal Station http://cardinalstation.cua.edu)
Former University President Very Rev. David M. O’Connell, C.M. stated, “for us at CUA, honoring the earth and the environment is not simply a matter of responding to an important social, political or secular cause — it is a way of celebrating our Creator and the gifts of His creation.” As a method of fostering this idea, the objective of this course is aimed to educate students in critical requirements, resources, and process of sustainable synergies in green building assessment.

Sustainable Strategies and Synergies in Building Assessment is a course which examines the predicament of contemporary architectural endeavor as an ecologically sustainable activity; a survey of vernacular passive “technologies” and an examination of current theoretical approaches to sustainability will define possible templates for practice. Case studies of state-of-the-art technologies and buildings will be used by instructor and students as teaching/learning vehicles. The course will assess a buildings’ inherent synergies, and assess environmental impact on building performance through diagrams and third party assessment.

Students will gain a fundamental comprehension of such strategies, technologies, professional reference standards, and study the structure and concepts of categories found in various building assessments – including LEED rating systems – in order to assess the cumulative synergies that result from a successful and logical integration of both technical and ethical environmental strategies applied to architecture.

A thorough study of the structure and concepts of the seven categories found in the LEED©2009 New Construction and Major Renovations Rating System - Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, Innovation & Design, and Regional Priority – shall comprise the format of the semester and provide a base for understanding this sustainable assessment rating system most commonly used in this country.

This course has been accepted by the Unites States Green Building Council (USGBC) as an official prerequisite for the Green Associate Examination administered by the Green Building Certification Institute (GBCI), increasing professional credentials in sustainable design practices of the architectural profession.

Instructional Methods
Presentations
Lectures
Quizzes
Exercises
(Optional) Lunch reviews at Pryz

Required Text
LEED Reference Guide for Green Building Design and Construction
Reading materials, web materials with full citations.
U.S. Green Building Council www.usgbc.org
USGBC LEED Green Associate Study Guide (after completion of class)
Strategies for Sustainable Architecture Paola Sassi
Sustainable Construction Charles J. Kibert
Ecological Architecture: A Critical History Steele, James
Ecological Design Sym Van Der Ryn, Stuart Cowen
Sustainable Energy Systems in Architectural Design: A Blueprint for Green Building Dr. Peter Gevorkian
Green Awareness: Going Green Book Series (Energy Efficiency, Comfort Conditioning, Electrical, Plumbing) Ferris State University College of Technology

Other materials (e.g. lab supplies, calculators)
Calculator – bring to each class

Course Goals
The course serves to explain the prescriptive guidelines for assessing and designing Sustainable Buildings through these methods simultaneously:

1. LEED Rating Systems
   a. Focusing on LEED NC
   b. Comprehensive analysis of the point system
   c. Collaborative design strategies to attain the points
   d. Technology implemented to achieve the design
   e. Actual projects with
      i. Points explained
      ii. Strategies implemented
      iii. Technology introduced

Goals for Student Learning
Goals for Student Learning: Students will acquire the basic understanding of strategies as organized by the LEED© 2009 building assessment system and realize their inherent synergies which foster an integrated building design, thus increasing professional credentials in sustainable design practices of the architectural profession.

Professional Standards Addressed
No cell phone usage in the classroom.

Course Requirements
CASE STUDY PRESENTATIONS:

The presentation shall focus on the design of sustainable airport. The selection shall be approved by the instructor during the first two weeks of class. Each student shall choose one airport for the semester’s sustainable case study presentation. The analysis is based on synergizing credits from the main categories of any one of the LEED Rating Systems.
First, a suitable Rating System must be chosen for the designated airport. Next, each student must describe orally and visually - through diagrams - how credits from each category effectively synergize, or have the potential to effectively synergize, if the design is changed.

The 5 main categories for analysis:
1) Site (choose 2)
2) Water (choose 2)
3) Materials (choose 2)
4) Indoor Quality (choose 2)
5) Energy (choose 2)

Additionally, each student must incorporate:
6) THREE Innovation and Design Credits
   a) Credit from rating system CI, EB:O+M, ND, etc…
   b) Credit from the online Credit Catalog
   c) Exemplary performance in any category
7) ONE Regional Priority Credit

Each student shall produce two presentations to collectively contribute towards one final ‘presentation’ grade. The two presentations shall comprise of:
   A. One preliminary slide presentation scheduled mid semester.
   B. One final slide presentation embodying all of the corrections from the preliminary slide presentation, and incorporating the remaining topics in the analysis.

The presentations shall be graded on thoroughness and comprehension of the following factors:
1. Examination
2. Justification
3. Quality

1. Students shall conduct an examination between the interface of credits and strategies through a flow chart that supports the main sustainable goals for the project and be able to diagram building systems involved with these strategies.
   a. Strategies
      i. Critical strategies used to implement points
      ii. Strategies used in point combination synergies
      iii. Points achieved / potential points
      iv. Certification potentially achieved
      v. Issues to be addressed with respect to achieving the goals:
         a. Social sustainability
         b. History
   b. Diagrams
      i. Sufficiently explain synergies between credits (critical building systems and context) through diagrams.
c. Technology
   i. Innovative technologies used to implement strategies

2. Students shall provide substantial **justification** of the following:
   a. Credits shall be documented through calculations, figures, and diagrams. This is critical in explaining how the sustainable goals have been accomplished in this project. Diagrams are imperative for conveying knowledge of sustainable systems and strategies – this includes diagrams of complex mechanical systems, solar systems, material systems, site analysis, logistical diagrams and any other diagram which serves to simplify complex information about building synergies.

   b. Unfulfilled credits and strategies which may have been implemented but were not included in the project scope should also be accounted to support the sustainable goals.

   c. Airport precedents will be explored to understand the potential of credits and systems. These precedents may also be used to substantiate metrics.

   d. Basic information will include:
      i. **Project background**
         1. Architect
         2. Location
         3. Size
         4. Scope
         5. Completion
         6. Occupancy
         7. Cost

      ii. **Bibliography**
         1. Students must provide a substantial bibliography of resources describing strategies used in other building precedents.
         2. Documentation includes minimally 3 books, 10 periodicals, and 10 online publications.

3. The graphic + oral **quality** shall be assessed. This requires that the presentation shall be include no more than 10 slides per person, incorporating images, diagrams, text and a verbal report which explains the aforementioned requirements organized in a very clear presentation through the case study.

**PARTICIPATION:**

"Blackboard Discussions” Add
In class attendance add
Add that it ca affect grade at the end of the semester!
MUST create profile in Bb and have a photo
**QUIZZES:**
Quizzes shall evaluate the student’s comprehension of the specific lesson from the previous lectures, case studies, student presentation, and primarily the lesson reading from the Reference Guide. Graduate students will be responsible for successfully completing an essay question in addition to the multiple choice questions.

**Assessment**
Comprehension of subject matter shall be assessed primarily by weekly quizzes and performance on the presentations. The final examination and presentation shall conclude the semester.

The following percentages have been assigned to calculating the final grade for both Graduate students and Undergraduate students. If variances are required, the instructor shall notify the class during the class time, or in writing:
- Quizzes: 30% (5)
- Student Synergy Exercises: 20% (2)
- Final Presentation 20%
- Final Examination 20%
- Participation 10%

**University grades:**
The University grading system is available at [http://policies.cua.edu/academicundergrad//gradesfull.cfm#II](http://policies.cua.edu/academicundergrad//gradesfull.cfm#II) for undergraduates and [http://policies.cua.edu/academicgrad//gradesfull.cfm#iii](http://policies.cua.edu/academicgrad//gradesfull.cfm#iii) for graduate students.

Reports of grades in courses are available at the end of each term on [http://cardinalstation.cua.edu](http://cardinalstation.cua.edu).

**Course Schedule**
- **August 26 (M)** Introduction to LEED©ing Green lecture:
- **September 2 (M)** Labor Day – no class
- **September 9 (M)** Lecture: Point Analysis, Strategies, Technologies + Rating System Implementation in Sustainable Sites including:
  - Construction Pollution Prevention
  - Selecting Sites
  - Brownfield classifications
  - Alternative Transportation
  - Stormwater Management
Heat Island Effect
Light Pollution

**September 16 (M)**  **Quiz 1** (Sustainable Sites, Point Analysis, Strategies + Integrated Design Process + Rating System Implementation)

**September 23 (M)**  Lecture on Water Efficiency, Regional Priority + Innovation in Design and Point Analysis, Strategies, Technologies + Rating System Implementation including:
- Baseline Prerequisite
- Water Efficient Landscaping
- Innovative Wastewater Technologies
- Water Use Reduction

**September 30 (M)**  **Quiz 2** (Water Efficiency, Point Analysis, Strategies)

**October 7 (M)**  **Student Sysnergy Exercises 1** + Synergy SS WE and Case Study: Norfolk Consolidated Courts Complex

**October 14 (M)**  Columbus Day – no class

**October 21 (M)**  **Quiz 3** (Energy + Atmosphere, Point Analysis, Strategies Performance Metrics + Rating System Implementation)

Lecture on Performance Metrics + Point Analysis, Strategies + Technologies in Energy + Atmosphere + Rating System Implementation including:
- Commissioning
- Optimizing Energy Performance
- Renewable Energy
- Refrigerator Management
- Green Power

**October 28 (M)**  Lecture on Point Analysis, Strategies + Technologies in Indoor Environmental Quality including:
- Outdoor Air Delivery Monitoring
- Ventilation
- Construction Management Plan
- Low Emitting Materials Indoor Pollutants
- Controllability of Systems
- Thermal Comfort
- Daylight + Views
Student Sysnergy Exercises 2 – EA + IAQ

November 4 (M)  Lecture on Point Analysis, Strategies + Technologies in Materials + Resources including:
Building Reuse
Construction Waste Management
Material Reuse
Recycled Content
Regional Materials
Rapidly Renewable Materials
Certified Wood

November 11 (M)  Quiz 4 (Indoor Environmental Quality Point Analysis, Strategies + Rating System Integration)

November 18 (M)

November 25 (M)  Quiz 5 (Materials + Resources Point Analysis, Strategies + Rating System Integration Regional Priority, Innovation in Design,)
+ Materials + Resources,

December 2 (M)  Final Juried Student synergy Presentations

December 9 (M)  Final Exam: 5:45 - 7:45 p.m.

(December 18 GRADES DUE)

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i Thermal performance of buildings, including climatic and passive solar design, and mechanical solutions. 
Prerequisite: ARCH202.

ii This studio explores “multiple-unit housing” (in the broadest sense of the word) of a moderate scale. In the exploration of the public/private spectrum throughout a variety scales, from city to room to the elements of architecture (and possibly to furniture), students are introduced to the ability of architecture to provide opportunities for social interaction and individual behavior. Issues of the nature of domesticity in its cultural context can also be explored. Attention should be paid to the site context as an important design determinate. The resolution of site as a particular condition and building types as ideal organizations will be central to the design exploration, while structure, tectonics, basic sustainable environmental control and some basic zoning and building code issues will also be of concern. Prerequisite: ARCH202.