CE 497/596 & ARC 503: SUSTAINABLE BUILDING DESIGN PROJECT – SPRING 2012

Instructors

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Class

Class Days: W F
Time: 3:00 p.m. - 4:15 p.m.
Classroom: Mann Hall 321 & Studio Space in KAM 300

On some days the class may go longer when there are in-class presentations and reviews.

URL: courses.ncsu.edu/ce596/

Office Hours

Please see times above

There may be occasions when we cannot keep, however, these office hours (due to meetings, conferences, etc.), We will try to keep you as fully informed as possible.

Other means for quick consultation: We will regularly monitor the course message board (available via the WolfWare system), and respond to posted questions. The message board is an effective forum for posting questions that would be of interest to others in the class, as well as to browse for others' questions and responses. If your question is individual in nature, then please feel free to call or send email to the instructors, especially if you think your question requires only a brief answer or explanation.

Suggested Textbooks
Computer Use

The project activities will require the use of computers. Everyone is expected to have an Eos account for general computing. You are expected to conform to all license and copyright agreements for any software to which you are given access. Information about Eos policies may be obtained by typing policy at the Eos prompt. Public computer labs are located throughout the campus, and the one in Mann Hall is located in Room 320.

Students who have access to their own computers are encouraged to use them where possible. In such cases, the students are expected to have the necessary software loaded on their computers as well as be proficient in the use of their own computers. Necessary files and basic instructions would be provided.

Grading

Written Reports & Presentations  70%
Wiki Journal & Participation  15%
Exit Interview/Oral Exam  15%

[Grading will be based on demonstration of proficiency, work ethic, intellectual rigor, and the quality of the end product. We will consider both process and product when determining your final grade. As outlined in the undergraduate or graduate catalog, grades will range effectively from A+ to F using +/- grading.]

Course Description and Objectives

The intention of this course section is to provide a structured context for architecture and engineering students to work collaboratively on a building and site design project. Students will research sustainable design strategies, and then work in small teams to implement these strategies in the design of a small, but flexible prototype suburban dwelling.

Instructors from the School of Architecture and the Department of Civil, Construction, and Environmental Engineering will serve as design "coaches," aiding students in their efforts by providing comments, suggestions, and assignments for further study.

While some work will be undertaken individually, teamwork will be required to become more familiar with Integrated Project Delivery methods and processes. The combined courses (ARC 503 + CE 497/596) will require a great deal of initiative, research, resourcefulness, and a collaborative approach on the part of participating students. Peer-student discussion and criticism of on-going work will be expected.

Pre-requisite: consent of instructors

Contents

See the weekly schedule for details. An overview is described below.

Ecological imperatives have altered the way architects and engineers collaborate in designing buildings. As a result, designers have responded with buildings that employ time-tested passive and vernacular strategies, and with more complex, technologically advanced tactics.

For many designers, this has initiated a reappraisal of value systems, and the criteria by which they judge success have been amended. Aesthetics and spatial composition are no longer the
only determinants of award winning or "good" architecture. Designers and clients alike are asking more specific questions that require quantifiable answers. What a building will look or feel like are still valid concerns, but how a building performs is gaining relevance.

This is not to say that the basics of form, proportion, and space no longer matter, or that aesthetics are a dying issue. More appropriately, designers are searching for ways to employ these basic elements in more sophisticated ways to achieve positive building systems results. Sophistication requires expertise, and expertise specialization. As such, successful building schemes rely on an integrated team of designers who are willing to collaborate from the earliest stages of design. The A/E professions have been doing this -- to varying degrees -- for a long time, but more recent initiatives have called for greater team integration across a broader range of professions.

Students from each college will work together on a semester-long project that will focus on performance and aesthetic aspects of sustainable building design. The collaborative studio will provide a testing ground for building simulation and design that considers innovative mechanical, electrical, structural, and cladding systems.

Students will employ various research and design methods including:

- Digital simulation (Building Information Modeling)
- Energy modeling
- Cost and environmental analysis
- Systems integration

Student teams will consult with professional and academic experts throughout the semester via team meetings, informal reviews, field trips, and public presentations. The studio will present its projects at the end of the semester, and produce a report of the work.

**Summary Project Statement**

For decades, the rapid development of U.S. suburban communities has resulted in large homes in high density, car-dependent neighborhoods. This prevailing design paradigm has been roundly criticized for its negative impact on natural landscapes, ecological systems, energy consumption, social relations, and personal health. Suburban reform efforts, such as Transit-Oriented Development, Smart Growth, and New Urbanism have fallen short because they focus on limited aspects of the suburban housing development problem. An enduring symbol of the postwar American dream is a detached home in the suburbs with a front lawn and back porch. Yet many homeowners living in large, suburban homes remain unsatisfied with their surroundings because design and construction quality has been sacrificed in order to maximize internal square footage. While technological advances and improved aesthetic design have permeated many manufacturing industries (e.g. automobile and electronic device producers), innovations in suburban housing have remained stagnant for the last half-century. The result is a widening gulf between homebuyers’ aspirations and what the homebuilding industry is willing and able to offer. Evidence for this gap can be seen in the decline of many suburban communities provides evidence of this gap – one that is growing wider in the current economic recession.

Architects throughout the twentieth century attempted to design and build novel houses, and residential experimentation is not a new trend. Following the First World War, Le Corbusier and other architects defined the problem of the house in socio-cultural terms by drawing attention to the poor living conditions of the lower classes in European cities. Inspired by the Industrial Revolution’s new modes of production, they believed that technology and mass-production would offer the best solution to the housing crisis. By the 1950s and 60s, architects were producing model houses for corporations like General Electric and Westinghouse that showcased new technology in single-family residences. While these projects heralded a new era in building systems that gave occupants more control of their thermal environment, they also necessitated
the use of fossil fuels and other non-renewable natural resources.

The outmoded, half-century-old suburban design paradigm stands in contrast to broad societal concern over social, economic, and environmental sustainability. Two critical sustainability challenges are to develop clean, affordable energy sources and conserve scarce resources, particularly water. As houses are responsible for a significant share (~22%) of annual US energy and water usage, they represent a key target for change. While new technologies, materials, and building systems can affect dramatic reductions in energy and water consumption, they have largely been ignored in the residential housing sector.

It is time to fundamentally rethink the design, development, and function of suburban communities to address sustainability concerns, create more livable homes and communities, and support a more diversified and itinerant population.

**Academic Integrity**

Students shall adhere to the University's policy on academic integrity found in the Code of Student Conduct (found in Appendix L of the Handbook for Advising and Teaching). This code can be found in the NC State University' website.

**Students with Disabilities**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653.

**Attendance**

Regular attendance is expected. If absence is necessary, let me know in writing or e-mail. A full statement of the University attendance policy can be found at [http://policies.ncsu.edu/regulation/reg-02-20-03](http://policies.ncsu.edu/regulation/reg-02-20-03).