ARCH 634

COLLEGE OF ARCHITECTURE, TEXAS A&M UNIVERSITY
ARCHITECTURAL LIGHTING – SPRING 2010
PROFESSOR LILIANA BELTRÁN, PH.D.

COURSE SYLLABUS

INSTRUCTOR

Dr. Liliana Beltrán
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Office hours: Friday 12:30 - 3:30 PM
Faculty e-mail and website: LBeltran@archmail.tamu.edu - http://archone.tamu.edu/faculty/lbeltran/
Lectures: Tuesday & Thursday, 12:45 - 2:00 PM, Langford A-323
Class website: http://eLEARNING.tamu.edu

CATALOG DESCRIPTION

Attributes of the lighting environment, lighting and energy issues, daylight availability, building design for daylighting, heat loss control, solar shading, daylighting models, graphical analytical and computer methods of analysis, visual and lighting comfort evaluation, integration of daylight and electric light, energy analysis.

COURSE OVERVIEW

The primary emphasis of this graduate seminar will be placed on daylighting and on three-dimensional and computerized models as tools for exploring daylight in architectural spaces. The course has four major objectives: (1) to discuss qualitative and quantitative issues in daylighting, (2) to learn the basics of photometry, (3) to use physical and computer models as tools for building performance analysis, and (4) to explore through a series of exercises a sense of your intuitive feel for light distribution in daylighted spaces. In meeting these objectives, the course will interweave discussion of daylighting as an architectural element with technical information concerning the measurement, documentation and analysis of light. Architectural issues will include perception, vision, daylighting techniques, precedents and standards. Technical presentations in support of modeling will cover photometrics, data acquisition techniques, model photography, computer modeling, and database analysis using microcomputers.

OBJECTIVE

This course explores qualities of daylight with some attention to an understanding of the physical and perceptual mechanisms that shape our experience of daylight. We will use three-dimensional and computer models as a tool for the analysis of daylighting in buildings. The distribution of natural light in an architectural space is a particularly complex process that defies realistic numerical analysis. Both physical models and computer simulation offer practical tools for the investigation of light in spaces. Well suited to the skills of an architect, these techniques can be used at all stages of the architectural design process. Models can predict a design's performance in quantitative detail and provide immediate visual information for assessment of qualitative issues. Student work will include the construction and

analysis of lighting models using real skies. Testing procedures will include the use of automated data acquisition systems and data reduction using microcomputer-based methods.

By the conclusion of this course I hope that you will feel comfortable with the fundamentals of daylighting and that you will be excited by the rich opportunities for creativity and expressive design that daylighting systems present. There is a whole lot more here than technical data, important as that data is. Both the designer and the user of buildings can enjoy the inspired design of daylighting systems.

STUDY VEHICLES

The class will be conducted as a seminar and will mix lecture presentations by the instructor with student presentations, class demonstrations, slide presentations, project reviews, software workshops, guest speakers and field trips. This semester the class will redesign different existing building program as a vehicle for exercises and discussion during the latter half of the class. Class presentations will cover the basic skills required to complete student modeling assignments. Reading assignments will be issued from the course bibliography. There will be a Final Exam based upon lectures and assigned readings on Wednesday, May 12, 2010 from 8:00 to 10:00 AM.

STUDENT ASSIGNMENTS

The course is structured around a series of modeling assignments. The best way to learn modeling is by building and studying models. The exercises are sequenced to introduce increasingly complex issues using models built to represent both existing and hypothetical spaces. The construction of models as group assignments and the reuse of models will keep student time commitments to a reasonable level. The course will also include a series of experiential exercises designed to increase a designer's awareness of light as an architectural element.

GRADING SYSTEM

The overall semester course grade will be based upon a cumulative tabulation of the various individual performance items described above, weighted as per the following schedule:

Class Participation	10%
Final Exam	20%
4 Assignments	40%
Final Project	30%
Total	**100%**

Class attendance is mandatory, and the assignments and final project must be submitted on the dates they are due.

Class participation: Class preparation, attendance, and participation are particularly important parts of this Daylighting Seminar. At some classes, each of you will be called on to present the analysis and recommendations of your assignments. Therefore, preparation prior to each class is essential. As a general rule students are expected to work in this class between 9-12 hours per week including the class period. Your grade for class participation will be a function of both your attendance and substantive contribution to class discussion.

Absences will be excused only for valid reasons, such as medical or other emergency.

	Subject:
1	Introduction
2	Daylight overview
3	Lighting terminology, model measurement
4	Model techniques, in-class model construction
5	Model photography and testing
6	Outdoor testing, temporal patterns, time lapse
7	Daylighting qualities
8	Photometric basics
9	Light meters and model measurements
10	Perception, shoebox model review
11	Visual performance, human comfort, lighting requirements
12	Sustainable daylighting, energy efficiency
13	Sunlight control, shading design
14	Daylight techniques, case studies
15	Design scheming, museum design
16	Parametric analysis using scale models, state of the art computer simulation
17	Electric lighting control systems, integration with daylight
18	Advanced lighting systems

NAAB CRITERIA *(for more information visit NAAB's website www.naab.org)*

Architecture students are expected to achieve a level of competence in the following areas:

2. **Critical Thinking Skills:** Ability to raise clear and precise questions, use abstract ideas to interpret information, consider diverse points of view, reach well-reasoned conclusions, and test them against relevant criteria and standards.
3. **Graphics Skills:** Ability to use appropriate representational media, including freehand drawing and computer technology, to convey essential formal elements at each stage of the programming and design process.
4. **Research Skills:** Ability to gather, assess, record, and apply relevant information in architectural coursework

7. **Collaborative Skills:** Ability to recognize the varied talent found in interdisciplinary design project teams in professional practice and work in collaboration with other students as members of a design team

15. **Sustainable Design:** Understanding of the principles of sustainability in making architecture and urban design decisions that conserve natural and built resources, including culturally important buildings and sites, and in the creation of healthful buildings and communities.

17. **Site Conditions:** Ability to respond to natural and built site characteristics in the development of a program and the design of a project.

19. **Environmental Systems:** Understanding of the basic principles and appropriate application and performance of environmental systems, including lighting, and climate modification systems, and energy use, integrated with the building envelope.

IMPORTANT NOTES:

COPYRIGHT NOTICE: The handouts in this class contain material that has been photocopied with permission from the publisher and are therefore copyright. "Handouts" includes all material generated for this class, which includes, but is not limited to: syllabi, quizzes, exams, in-class notes and handouts and assignments. Therefore, the copyright material in this class should not be copied without prior permission from the instructor.

NOTE ABOUT PLAGIARISM: Plagiarism consists of the passing off as one's own ideas, words, writings, etc., which belong to another. In accordance to this definition you are committing plagiarism if you copy the work of another person and turn it in as your own. If you have questions about plagiarism please consult the Texas A&M University Student Rules book, under the section "scholastic dishonesty".

NOTE FOR STUDENTS WITH DISABILITIES: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statue that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you believe you have a disability requiring accommodation, please contact the Office of Support Services for Students with Disabilities in Room 126 of the Koldus Building. The phone number is 845-1637.

NOTE ABOUT ABSENCES: The university views class attendance as an individual student responsibility. Students are expected to attend class and to complete all assignments. Instructors are expected to give adequate notice of the dates on which major tests will be given and assignments will be due. The student is responsible for providing satisfactory evidence to the instructor to substantiate the reason for absence. Students are advised to consult the University regulations for a list of authorized absences.

ACADEMIC INTEGRITY STATEMENT: "An Aggie does not lie, cheat, or steal or tolerate those who do."
Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.
For additional information visit: www.tamu.edu/aggiehonor/