

ARCH 207 ENVIRONMENTAL CONTROL SYSTEMS 1

2 Units, Required Lecture/Activity Course, Spring Quarter

DESCRIPTION:

Theory and application of climate, energy use and comfort as determinants of architectural form in small-scale buildings. Emphasis on architectural methods of ventilating, cooling, heating, and lighting for envelope-load dominated buildings.

2 lectures, 2 activities.

Prerequisite: PHYS 122 or 132. Co-requisite: ARCH 253

LECTURE:**OBJECTIVES:**

The student will:

Grasp the societal implication of utilizing non-renewable and renewable energy sources.

Realize how the relationship between building form, scale and location affects a building's successful adaptation to the environment, and contributes to its use of energy and its ability to satisfy needs for human comfort.

Realize the implication of orientation of buildings on their sites.

Understand and apply the principles of heat flow.

Understand how heating and cooling is potentially integrated with other aspects of design, through the study of existing buildings.

Understand the fundamentals of psychrometrics.

Identify climatic characteristics of hot arid, hot humid, cold and temperate regions as well as the appropriate Architectural responses in those areas.

Design buildings that respond to solar geometry, daylight, and meet the fundamental requirements for passive heating and cooling.

CONTENTS:

Lectures on the following topics; studio problems designed to allow application of lecture materials.

Bio-Climatic Design.

Climate Analysis and Place Responsive Architectural Design.

Heat Transfer and Building Materials.

Heat Transfer and Human Thermal Comfort.

Solar Geometry: Prediction Methods and Design Tools.

Sun and Architecture: Strategies for Passive Heating.

Sun and Shade: Strategies for Shading Windows.

Passive Cooling Principles and Design Strategies.

The Luminous Environment: Light as Architectural Formgiver and the Theory and Perception of Light.

Daylighting Sources and Concepts: Light and heat; sky conditions; visualizing light.

Daylighting Design Strategies.

REQUIREMENTS & INSTRUCTIONS:**METHODS OF EVALUATION:**

The basic grade in the lecture portion of this course is earned through performance on two multiple choice, open note exams:

Midterm (1 hour) 50%

Final (2 hours) 50%

However, a student may RAISE this grade by doing an extra credit project: a first-hand investigation and Architectural case study of a place-responsive building in the region, or LOWER this grade by failing to attend lecture, as indicated by two (or more) "pop" quizzes given during the term.

The overall course grade is determined 50%/50% from the lecture portion and activity portion of this course.

REQUIRED TEXT

Heating, Cooling, Lighting: Design Methods for Architects, Lechner, Norbert (2001).

Reference Text: Sun, Wind & Light, Brown and DeKay (2001).

ACTIVITY:**OBJECTIVES:**

The student will:

Integrate of climate responsive design for heating, cooling and lighting in their Architectural studio projects.

Test and reinforce concepts introduced in the lecture portion of the course and their required reading, including site analysis, environmental measurement, solar geometry, shading devices for windows and daylighting strategies.

CONTENTS:

Four lab exercises designed to reinforce concepts of environmental measurement and analysis and four lab assignments aimed at increasing understanding of climate responsive Architecture through case study, and design development of projects in ARCH 253:

1. Case Study of Climate-responsive Architecture

2. Climate Analysis: Graphics and Interpretation

3. Shading Model Study

4. Daylighting Studies

REQUIREMENTS & INSTRUCTIONS:

The grade is earned through performance and completion of 3 in-classroom exercises and 4 activity assignments, and attendance in classroom. A student may LOWER this grade by failing to attend a class or late submission of a assignments.

The overall course grade is determined 50% / 50% from the lecture portion and activity portion of this course.