

**ARCH 307 ENVIRONMENTAL CONTROL SYSTEMS 2**

2 Units, Required Lecture/Activity Course, Winter Quarter

**DESCRIPTION:**

Theory and application of climate, energy use and comfort as determinants of architectural form in large-scale buildings. Emphasis on architectural and mechanical methods of ventilating, cooling, heating, lighting, acoustics, and water and waste systems for internal-load dominated buildings.  
2 lectures, 2 activities.

Prerequisite: ARCH 207. Co-requisite: ARCH 352.

**LECTURE:****OBJECTIVES:**

At the end of this course, the student will be expected to:

- Achieve integrated environmental control system solutions as Architectural form determinants.
- Demonstrate knowledge of balancing heating, cooling, and daylighting considerations in small to medium scale buildings.
- Understand selection criteria for appropriate environmental control systems early in the design process.
- Size and layout elements of environmental control systems.
- Demonstrate knowledge of California Energy Standards.
- Recognize the implications of Architectural design decisions on resource consumption.

Students success at meeting these objectives will be measured through various forms of participation and tests in lecture and through participation and exercises in laboratory.

**REQUIREMENTS & INSTRUCTIONS:****REQUIRED NOTEBOOK**

The lecture and activity notes should be organized into an 8-1/2" x 11" 3-ring notebook. The student, during open-note examinations, may use this notebook. The contents may include handwritten lecture notes, handouts from lecture and activity, activity exercises, and notes from the readings. Photocopies from the text are not allowed in the notebook. Notebooks will be checked in activity sessions according to your instructor's schedule.

**GRADING**

Lecture grades will be based on class participation (quizzes and attendance), a midterm, and a cumulative final exam. Laboratory grades will be based on lab activities such as participation, attendance, quizzes, and exercises.

Lecture participation/quizzes:	10
Midterm exam:	40
Final exam:	50
Laboratory:	100
	Total: 200 points

Act 1 – Integration Warm-Up:	10
Act 2 – Water + Waste:	10
Act 3 – Lighting:	10
Act 4 – Acoustics:	30
Act 5 – Thermal Optimization:	20
ECS + Design Integration:	20
	Total: 100 points

**Required Reading:**

California Energy Commission, 2001. Excerpts from the Residential Manual for Compliance with the Energy Efficiency Standards. Sacramento: California Energy Commission.

County of San Luis Obispo, 1992. San Luis Obispo County General Plan Noise Element, San Luis Obispo: County of San Luis Obispo.  
Stein, B. and John Reynolds, 2000. Mechanical and Electrical Equipment for Buildings. 9th Edition. New York: John Wiley + Sons

**ACTIVITY:****OBJECTIVES:**

That students develop a "rules of thumb" working knowledge of core ECS topics such as day lighting, electric lighting, thermal performance of buildings, acoustics and water and waste systems

That students recognize that the designer has the responsibility to configure buildings so they are healthy for occupants and are resourceful and efficient  
That students learn to conceptualize buildings not as discrete objects but rather as an assemblage of systems and elements that are connected to and interact with the larger world. Discussions in this class will focus less on the what (what it is, what it looks like) and more on the how (how it works, how it interfaces with the surrounding environment).

That students are able to competently analyze an aspect of their building design project from the perspective of environmental performance (acoustic quality, shading of a window, appropriate daylight levels, and so on) and use this analysis to inform and inspire subsequent design work.

That students recognize that ECS knowledge is not distinct from design knowledge

**CONTENTS:**

The majority of in-class time will be spent working on lab exercises and linked design integration assignments. There will be other in-class activities as well, such as short presentations, charrettes, field trips and discussions. The quality of the discussions and learning will depend on the quality of the work.

**REQUIREMENTS & INSTRUCTIONS:****Nature of Assignments/Methods of Work**

Introductory group assignments provide students an opportunity to explore the poetic and experiential potential of ECS, and serve as a conceptual framework for understanding ECS in the context of design. Later assignments entail the analysis of a specific aspect of the design studio project from an ECS point of

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view, and a subsequent refinement and improvement of the design based on this analysis.

As part of this activity, you will be required to work with various kinds of measuring equipment (sound level meters, light meters, anemometers, miniature data loggers, etc.). When you sign out equipment, you are agreeing to take responsibility for the equipment and to return it on time and in the condition it was given to you.

**Means of Evaluation**

The topics covered in the Lab are the same as those discussed in the lecture; please refer to the ECS 307 lecture syllabus for an understanding of how your work in this Lab will be evaluated and graded. The maximum number of points you can receive for this lab is 100. There are five lab exercises with a cumulative maximum total of 80 points. The remainder of your grade (20 points maximum) will be determined by your integration of selected ECS themes in your studio project and by the level of thought and creativity expressed in your responses to 'ECS aphorisms' (see the 'Phenomenological Aphorisms' that follow).