

Architecture 407 Lab
Environmental Control Systems III
Fall Quarter

LABORATORY SYLLABUS

Instructor

Prof. Margot McDonald
Office: 34-220D / Phone: 756-1298 / mmcdonal@calpoly.edu
Office Hours: MW 12:10pm-1:00pm, T 11:10am-12:00pm

Course Overview

Architecture 407 laboratory concentrates on the integration of building environmental systems (heating, cooling, lighting, plumbing, acoustics, electrical, and vertical transportation) with other design considerations. The focus is large scale, internally load dominated building types with an emphasis on innovative environmental solutions.

Meeting Format

Class meetings are twice weekly for 3 hours on M W or TR. The first hour will be dedicated to presentation of material by the instructor or by students. The remaining time will be spent in lab working on assignments. I would like to promote a cooperative learning environment where students help students and small work groups may be formed as problem-solving teams.

Study Vehicle

Lab work will consist of (1) Exercises, (2) Dynamic Models (spreadsheets), and (3) Review Questions (from lecture and text). Emphasis is on the Exercises which include a building case study followed by a detailed study building used in evaluation of all building systems. In addition there will be a series of short exercises most of which will be accomplished within class time. Bring text, calculator, diskettes, and other supplies to be able to work in the lab space.

Assignment Format

Use 8-1/2 x 11 or 11x17 sheets for your work. Paper can be trace, vellum, or bond. Graphic clarity is essential but this does not imply "drafted" work. Freehand sketches or computer drawings are acceptable. Create or purchase an expandable 8-1/2 x 11 portfolio for your work.

Grading

Laboratory grades will be based on in-class and homework Exercises and Dynamic Models (equal to 90%) and Review Questions (equal to 10%). Participation will be noted. Grading of assignments will be discussed when the assignment is given. Late work will be penalized. To be counted for credit, all work must be submitted by Friday, Dec. 2nd, 5pm.

Note: Student work may be selected from this course for accreditation archive.

Materials The Architect's Studio Companion, Allen, 2002.

Lab Fee \$8.00 billed automatically by University Cashier

**Architecture 407 Lab
Environmental Control Systems III**

L A B S C H E D U L E

1	SEP 20	21 Environmental Building Strategies (#1)	22	23 In-class: Topic identified/ research begins	24
2	27	28 PRESENTATIONS (#1) Preliminary Design: Loads (#2)	29	30 In-class: Loads analysis and presentation discussion	OCT 1
3	4	5 LOADS DUE Spatial Ordering / Rough Dimensions	6	7 In-class: Spatial and dimensional rules	8
4	11	12 SPATIAL/DIM DUE Zoning	13	14 In-class: Zones: thermal, lighting, acoustics,plumb'g, vert'l transport	15
5	18	19 ZONING DUE Structural/Mech/Vertical Transport Systems (#3)	20	21 In-class: Developing criteria	22
6	25	26 (cont'd)	27	28 In-class: System selection	29
7	NOV 1	2 SYSTEMS DUE (#3) Computer Evaluation	3	4 <i>Field trip to S.F.</i>	5
8	8	9 Reflected Ceiling Plan: HVAC & Elec. Lighting (#4)	10	11 VETERANS' DAY HOLIDAY	12
9	15	16 PLAN DUE (#4) Evaluation of Campus Building (#5)	17	18 In-class: drawing analysis	19
10	22	23 EVAL. DUE (#5) Campus Building Tour	24	25 THANKSGIVING HOLIDAY	26
11	29	30 Design Process Review – Integrating Bldg Systems	DEC 1	2 FINAL EXAM REVIEW	3

**Architecture 407 Lab
Environmental Control Systems III**

WEEK 1 - ENVIRONMENTAL BUILDING STRATEGIES FOR LARGE BUILDINGS

What are the currently recognized building strategies that apply to energy conservation, passive design, healthy buildings, and building systems integration? Give examples of each strategy as well as an indication of public and professional acceptance of the idea. What do you think are the primary concerns that relate to comfort, health, and occupant satisfaction in the interior environment? What can you as a designer do to improve these environmental conditions?

EXERCISE #1

In teams of two or three identify a building that illustrates several of the environmental strategies identified in class. Your study building must include ventilation as a primary building environmental controls strategy. Plan a 20-minute presentation of the building case study. The presentation should utilize slides, transparencies, or the web and a written report. Include three questions to ask of the class at the beginning of your presentation. Be sure that your discussion includes how the building design relates to its site and climate.

Assigned	T	SEPT 21
Presentations	T	SEPT 28

WEEK 2, 3, AND 4 - DETERMINING BUILDING ENVIRONMENTAL LOADS AND INTERIOR ZONING IN PRELIMINARY DESIGN

What are the various building "loads" that impact the choice of HVAC system? What are some of the architectural strategies that can be used to reduce mechanical loads? What are the criteria for differentiating thermal zones inside a building?

EXERCISE #2

You will evaluate several zoning aspects of your design for this exercise: thermal, ventilation, acoustical and lighting. First, list the criteria for each of the spaces relative to thermal, ventilation, acoustical, and lighting needs. Next, list the solutions that best provide for these criteria. Finally, organize your solution so that it satisfies as many (or the most important) criteria as is possible.

Assigned	T	SEP 28
Due	T	OCT 19

**WEEK 5 & 6 - STRUCTURAL/MECHANICAL SYSTEMS SELECTION
PLUMBING/ELECTRICAL/VERTICAL TRANSPORT**

Using a study building, develop criteria and select appropriate structural and mechanical systems to the design concept.

EXERCISE #3

List the criteria that should influence your choice of structural system. Then identify the systems that best meet the stated criteria. From the list of alternatives identify which one offers the best compromise. Similarly for mechanical systems, etc.

Assigned	T	OCT 19
Results due	T	NOV 2

**Architecture 407 Lab
Environmental Control Systems III**

WEEK 7 - MIDTERM RESULTS / COMPUTER EVALUATION/FIELD TRIP

Visit to San Francisco (possible extended trip to Sacramento and Davis).

SCHEDULE

SF P.G. & E. Energy Center	H	Nov 4
SF Acoustical Consultant	H	Nov 4
[Sacramento - Office Buildings	F	Nov 5
Village Homes, Davis/SMUD Conference	S	Nov 5]

Students unable to attend the field trip will be given a local assignment.

WEEK 8 - REFLECTED CEILING PLAN / ELECTRIC LIGHTING - HVAC DESIGN

A significant impact on a space is the provision of electric lighting (in conjunction with daylighting) and the provision of HVAC distribution within the space. Making these two elements work together is of the utmost importance for maintaining visual and thermal comfort.

EXERCISE #4

You will perform zonal cavity calculations, select lighting fixtures from manufacturer catalogs, and produce a lighting design that works with HVAC components also in the ceiling plane.

Assigned	T	Nov 9
Presentations	T	Nov 16

WEEK 9 - EVALUATION OF A CAMPUS BUILDING

Reading mechanical drawings and understanding how existing buildings have been designed can aid in our understanding in producing new design. In some cases this is simply avoiding mistakes.

EXERCISE

You will select a campus building from the list provided and analyze it from the worksheet provided.

Assigned/In-class work	T	Nov 16
Results due	T	Nov 23

WEEK 10 - CAMPUS TOUR

We will visit several campus buildings including some of those evaluated in the previous exercise.

TOUR	T	Nov 23
------	---	--------

Write a summary of tour.

Architecture 407 Lab
Environmental Control Systems III

WEEK 11 - DESIGN PROCESS REVIEW / GUEST SPEAKER (TBA)

We will look at how the design process is shaped by consideration of building environmental systems, review the steps involved, and discuss how to be more effective in managing this aspect of the design problem.

EXERCISE

Assigned	T	Nov 23
Results due	H	Dec 2