ARCH 491 Environmental Control Systems I
DEPARTMENT OF ARCHITECTURE
School of Architecture and Allied Arts
University of Oregon

COURSE: ARCH 491 – Winter 2010  CRN: 491: 20722
4 credit hours; one of two required ECS courses for architecture students

INSTRUCTOR: Professor Alison Kwok, Adjunct Professor Roger Ota

LECTURES: Tuesdays and Thursdays: 8:30 – 9:50PM, 177 Lawrence

LABS: 8 discussion sections will be held on Tuesday, Wednesday, Thursday, at various times and locations (see DuckWeb for details and options)

TEXT/MATERIALS: Required: Mechanical and Electrical Equipment for Buildings, 11th edition; Pilkington Sun Angle Calculator; The Green Studio Handbook, (Kwok and Grondzik); Thermal Delight in Architecture (L. Heschong); UO iClicker


PREREQUISITES: Recommended: college physics; open to non-majors.

GRADING: 491 EITHER GRADED OR P/N: undergraduates 491 PASS requires minimum equivalent grade of C-

REDUCE ENERGY
RECYCLE ENERGY
RE-USE ENERGY

FINAL PROJECT PRESENTATIONS: Monday, March 15 2010 noon-2:00pm
(Wednesday, March 17, 2010, 8:00-10:00am possible alternative)
BACKGROUND: Environmental Control Systems combines the three major influences on architecture: social, aesthetic and technical. This course is designed to help you to quickly test your designs to see if they meet ECS criteria; through a series of projects. Although these criteria are stated in a technical (easily calculated) way, they carry with them significant opportunities for social and aesthetic development. Some of the most interesting ways in which people interact with buildings involve lighting, heating, cooling, ventilation, sound, and water supply/waste. Buildings are considered "successes" or "failures" in large part by how successfully they provide both the comfort and the inspiration promised by our senses of sight, sound, touch, and smell and taste. All these senses are involved in the person/ECS interaction. This first term will deal mostly with the senses of touch and smell, including thermal comfort and air quality. The emphasis on sight (light), hearing (acoustics), and taste (water supply) will be the topics during spring term. By the conclusion of this course, we hope that ECS will have excited you by its richness of design criteria, and its many opportunities for creativity and expression. 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 inspired design of environmental control systems.

OBJECTIVES: To develop a deeper understanding of the relationship between architectural design and passive and active building systems, thermal comfort, and energy conservation. This design-centered, hands-on course is intended to help students develop the ability to quickly test their architectural designs against fundamental ECS criteria that are informed by an ethic of wise and conservative use of environmental resources.

INSTRUCTIONAL OBJECTIVES: The following instructional objectives follow the "1998 Guide to Student Performance Criteria" (37 criteria based upon an integrated approach to architectural education) distributed by the National Architectural Accrediting Board. The objectives of this course are to: understand the basic principles that form the design of environmental systems, strongly emphasizing the following Student Performance Criteria: (4) Research Skills; (7) Collaborative Skills; (11) Use of Precedents; (12) Human Behavior: Understanding of the theories and methods of inquiry that seek to clarify the relationship between human behavior and the physical environment; (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; (19) Environmental Systems: including acoustical, lighting, and climate modification systems, and energy use, integrated with the building envelope; (21) Building Envelope Systems; (22) Building Service Systems; (23) Building Systems Integration; (24) Building Materials and Assemblies; (26) Technical Documentation

LEARNING VEHICLES: In addition to weekly quizzes based upon lectures and assigned readings, each student will participate in a weekly discussion/lab section. Homework assignments will consist of application based projects related to envelope design, solar geometry. In-section exercises will involve activities/calculations that develop a better understanding of the concepts and principles of these topics. Teams of students will complete a final project – case study investigation of a real, nearby building on a topic related to one covered in the current term.

COURSE ACTIVITIES
Lectures will include:
• Discourse about the connections between a building’s performance characteristics, climate response, and the architectural design decisions that influenced them. We will promote critical thinking.

Lab sections will include:
• In class and take home exercises that help to elaborate on principles and concepts from lecture;
• Opportunities to develop inquiry questions, hypotheses (“hunches”), and methodologies for gathering information for case study investigations;
• Field investigations during building visits on various building performance topics (e.g. lighting levels, energy use, glare, etc.), comparing results to design intent, various standards and codes.
• Develop case studies for the web, develop a research paper.

EVALUATION: Course grades will be based on quizzes, mini-design exams, homework project, in-class exercises, final case study project, participation and attendance.