U of O: School of Architecture and Allied Arts

**ARCH 492/592 Environmental Control Systems**

SYLLABUS Winter 2019

Instructor: Lisa Petterson, AIA, LC, LEED AP BD+C, NCARB

SRG Partnership

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**Meeting Time:** 5:00 – 7:50 PM, Mondays + Saturday Jan. 21st, Jan 28th , Feb. 11th and Mar 4thfrom 10:00am to 12:50pm

**Location:** Portland Campus, White Stag Building

**Credit:** Four Credits

**Grading:** Pass/No Pass or Graded

**Office Hours**: Monday 4:40 PM to 5:00 PM / 7:50 to 8:20 PM or by Apppointment

**Overview:**

This course is the second in a two-part series on environmental control systems. The emphasis is on sight (light), hearing (acoustics), taste (water) and smell (waste). The class will discuss environmental control systems as an integral aspect of the design process rather than as an applied after-thought.

The first part of this course focuses on architectural lighting, the rendering of building form in light. Emphasis for this portion of the class will be on understanding the basic principles of lighting and perception as a foundation for generating clear and successful design concepts, with a balance of practical and technical instruction so that designers can assume responsibility for lighting with increased confidence and renewed potential.

The second part on the course will focus on the issues around water conservation, waste water treatment, acoustics, and fire and life safety systems. The class will emphasize design issues over technical concerns, using a series of in-class explorations and take home exercises.

GOALS:

This course should enable students to do the following:

• Evaluate the success or failure of an existing lighting design

• Use light as an architectural element

• Identify a range of common lamp types / fixture types and when to use them

• Document a lighting design by producing a lighting layout, details, and fixture schedule and catalog cuts

• Integrate daylighting with electric lighting as an energy conservation strategy

• Understand a broad range of water conservation strategies

• Understand a broad range of wastewater treatment strategies

• Understand the principles of acoustic design

• Understand the integration of fire and life safety system in the design

**Instructional Methology:**

Students are expected to do the readings prior to each lecture in order to expand on topics during the in-class actitivies and lecture discussions. In class explorations will be performed in groups of 3 to 4 students. Homework assignments (Exercises) must be done individually in order for a student to receive credit. Attendance is required for all lectures and Saturday sessions. Unexcused absenses are not permitted. There will be weekly quizzes covering each week’s topics. This is intended to keep track of student’s participation, learning progress and applications of the course material. There is no – make up for pop quizzes or in class activities. The final grade for both quizzes and class participation will be based on an average of all grades with the lowest score on the quizzes and on the in-class explorations thrown out.

**Required Texts:**

The following text is available for purchase at the Oregon Bookstore.

*Mechanical and Electrical Equipment for Buildings (MEEB) – Eleventh Edition* by Walter T. Grondzik, Alison G. Kwok,

Benjamin Stein, John S. Reynolds

**Supplemental Texts:**

The following books are on reserve in the library.

*Concepts is Architectural Lighting*, M. David Egan

*Concepts in Architectural Acoustics,* M. David Egan

*Perception and Lighting as Formgivers for Architecture,* Lam, William*;*

*Sunlighting as a Formgiver for Architecture;* Lam, William*;*

*Light Revealing Architecture;* Millet, Marietta;

*Lighting Design Basics,* Mark Karlen and James Benya

**Evaluation:**

Performance in ARCH 492/592 will either be graded or pass / no pass (P/NP) to be selected by the student. A 492 pass is equivalent to a (C-) and 592 Pass is equivalent to a (B-).

Student work will be evaluated base on the following percentages:

Quizzes (20%) Lowest grade will be dropped

Class participation (20%) Includes attendance, participation, and in class explorations.

Homework Assignments (40%) 4 Assignments – must be done individually

Final Project (20%) Final design problem – must be done individually

Grading is not set on a curve.

97.1% - 100% A+

93.1% - 97% A

90.1% - 93 A-

87.1% - 90% B+

83.1% - 87% B

80.1% - 83 B-

77.1% - 80% C+

73.1% - 77% C

70.1% - 73 C-

67.1% - 70% D+

63.1% - 67% D

60.1% - 63 D-

All assignments are due at the beginning of the lecture, unless otherwise annouced. Assignments (other than the final) will be accepted a maximum of week late with a 25% penalty. The final project will not be accepted past the due date. Incompletes are only given for medical emergencies and then only with authorized and written approval from the instructor.

**Academic Honesty**

Academic honesty is expected. Any cases of academic plagiarism or cheating will be reported to the Student Conduct Coordinator and handled as described in the University's Student Conduct Code. Such cases would include collaborating or copying during quizzes, copying work for individual assignments, and including the work of others in case studies without appropriate credit. All "homework" assignments are individual assignments, unless otherwise noted -- discussion of the general procedures and processes for such assignments is acceptable and encouraged, but all work submitted must reflect the individual thinking and decision-making of the submitting student. The in class explorations are intended to be group projects where the submitted work reflects the considered judgment of a specific group of students.

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**ARCH 492/592 ENVIRONMENTAL CONTROL SYSTEMS**

COURSE OUTLINE Winter 2019

WEEK 1 **PERCEPTION**

*Monday Jan 7th* – *NATURE OF LIGHT/ WHAT MAKES A GOOD LUMINOUS ENVIRONMENT?*

• Perception

• In-class Exploration A – PERCEPTION

• Terms and Definitions

Required Reading: Lam PALAFFA chap. 1, 2, 3

MEEB pg. 467-490

Supplementary Reading: LIGHT REVEALING ARCHITECTURE pg. 6-92

WEEK 2 **LIGHTING DESIGN TECHNIQUES:**

*Monday January 14th– What is Daylight? / Lighting Design Techniques*

• Designing with Light

• Window Placement / Window Size / Window Location

• In-class Exploration B – DAYLIGHT FACTOR

Required Reading: DAYLIGHTING PERFORMANCE AND DESIGN pg.3-20

MEEB pg. 525-530

Supplementary Reading: CONCEPTS IN LIGHTING chap. 6 pg. 167-202

WEEK 3**LIGHT QUANTITY DAYLIGHTING**

*Jan. 21st Martin Luther King Day NO CLASS*

*Saturday Jan. 26th – WINDOW FORM AND MEANING*

• In-class Exploration C – Window Form and Meaning

Required Reading: MEEB pg. 587-626

Supplementary Reading: LIGHT REVEALING ARCHITECTURE pg. 93-148

***EXERCISE ONE DUE***

WEEK 4 **LAMPS**

*Monday Jan. 28th* – *LAMPS*

• Color Temperature / Color Rendering

• Incandescent/ Fluorescent / HID/ LED

* Electric Lighting Examples

• In-class Exploration D – SCAVENGER HUNT

Required Reading: MEEB pg. 514-524, 531-562

Supplementary Reading: LIGHTING DESIGN BASICS pg. 3-30

WEEK 5**LUMINARIES**

*Monday February 4th* – *LUMINAIRE SELECTION/ DETAILING*

• Guest Speaker – Luminaires

• Luminaire Selection Criteria

Required Reading: MEEB pg. 514-524, 531-562, 572-586, 629-649

***EXERCISE TWO DUE***

Supplementary Reading: LIGHTING DESIGN BASICS pg. 3-30

*Saturday Feb. 9th* – *ELECTRICAL LIGHTING FIXTURE DESIGN*

• In-class Exploration E– CUSTOM FIXTURE DESIGN

WEEK 6 **ELECTRIC LIGHTING CALCULATIONS**

*Monday February 11th – DESIGN PROCESS / CONTROLS / CODES / DOCUMENTATION*

• Drawings / Fixture Schedules

• Energy Code / IES Recommendations

• Point Method / Lumen Method

• In-class Exploration E – LIGHTING CALCULATIONS

Required Reading: MEEB pg. 491-514, 563-586, 649-688,

Supplementary Reading: LIGHTING DESIGN BASICS pg. 37-44, pg. 55-72

WEEK 7 **ARCHITECTURAL ACOUSTICS: BASICS**

*Monday February 18th – ACOUSTICS*

• Design Applications

• Acoustics STC and IIC

• Guest Speaker – Acoustics

• In-class Exploration F – ACOUSTIC DESIGN

Required Reading: MEEB pg. 782-861

Supplementary Reading: CONCEPTS in ACOUSTICS

***EXERCISE THREE DUE***

*Sat. February 23 FIELD TRIP*

• Field Trip

WEEK 8 **WATER and WASTE**

*Monday February 25th – WATER CONSERVATION/ WASTE WATER SYSTEMS*

• Water Systems

• Hydrological Cycle

• Guest Speaker – Waste

• In-class Exploration G– WATER CALCULATIONS

Required Reading: MEEB pg. 909-998,MEEB pg. 999-1081

WEEK 9 **DESIGN INTEGRATION**

*Monday March 4th – FIRE and LIFE SAFETY SYSTEMS*

• Building Automation

• Fire Suppression / Control Systems

• Egress Systems

• Smoke Management

Required Reading: MEEB pg. 1085 - 1161

***EXERCISE FOUR DUE***

WEEK 10 **REVIEW WEEK**

*Monday March 13th NO CLASS*

WEEK 11 **FINALS WEEK** **FINAL SKETCH PROBLEM DUE**

*Monday March 20th*

• In class review of sketch problems