ARCH 263: Integrated Environmental Systems Fall 2018

Course Description

A focus on the integrated environmental systems of buildings with an aim to develop the knowledge and skills appropriate to architectural practice. Subjects covered include environmental comfort parameters, heating and cooling loads, energy conservation, ventilating and air conditioning systems, residential and commercial heating and cooling systems, air, water, and refrigerant based systems, artificial source lighting and daylighting, with reference to building codes and standards. Case studies and projects will be included to help bring real-world relevance to the topics.

Learning Objectives

- Develop an awareness of mechanical building systems and terminology.
- Develop an understanding of the various attributes of mechanical systems, including space requirements, performance, capital costs and energy efficiency.
- Gain an ability to develop conceptual mechanical system designs for various applications.
- Understand performance requirements sufficiently to explore alternative solutions as part of a multi-disciplinary design team.

The focus is on the needs of the architect, i.e., the schematic design, appropriate application, and operational aspects of building systems for indoor comfort and energy efficiency.

Lectures	Wednesdays **9:00 AM to 12:00 PM**
Instructors	**Mr. Aaron Grin**
	E-mail: agrin@rdh.com
Teaching Assistant	**Ms. Alex Martin**
	E-mail: **almartin@uwaterloo.ca**

Format: Lectures, slide shows, case studies, and practical design. Calculations and many concepts and design principles.

Marks will be assigned through

• Assignments [3 x 15%]	45%	
• Quizzes [3 x 10%]	30%	
• Final Project	25%	likely due Nov 28

Submission Requirements: Quizzes and two in-class Assignments will be assigned, completed by hand, and submitted during the lecture timeslots. In addition to specific instructions for each assignment, all assignments must be submitted in .pdf form, that includes a separate cover page with the students' full name(s) and ID# (s) clearly presented. The last assignment will be presented in-class in the final lectures.

Lateness Policy: Assignments and projects submitted after the given due date and time will be immediately penalized 50%. After 24 hours a grade of zero will be entered.

Lecture Outline

Setting the Stage

- Introduction, overview, and some history

Stage One: Heat Loss & Heat Gain

- Psychrometrics, Latent and Sensible Heat
- Energy Efficiency, Thermal Comfort, and Control
- Effects of design on efficiency

Stage Two: Environmental & Mechanical Systems

- Generation (Making Hot & Cold)
- Distribution & Delivery (Air, Water, Direct)
- Dehumidification & Humidification
- Ventilation & Filtration: The most important function of HVAC Systems

We will also spend some time providing background technical information and support for the final Studio projects in the final lectures.

Reference Materials:

The Architecture of the Well-tempered Environment, Second Edition by Reyner Banham, 1984, The University of Chicago Press.

Heating, Cooling, Lighting, Design Methods for Architects, Any Edition
by Norbert Lechner, John S. Reynolds. e.g. 2nd ed, 2001, John Wiley & Sons, Inc.

Mechanical & Electrical Equipment for Buildings, 11th Edition
by Walter Grondzik et. al. 2010, John Wiley & Sons, Inc.

Plumbing, Electricity, Acoustics, Sustainable Design Methods for Architecture
by Norbert Lechner. 2012, John Wiley & Sons, Inc.

The Architect's Studio Companion: Rules of Thumb for Preliminary Design
by Edward Allen and Joseph Iano. 2011, John Wiley & Sons, Inc.

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check www.uwaterloo.ca/academicintegrity/ for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity [check www.uwaterloo.ca/academicintegrity/] to avoid committing an academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, www.adm.uwaterloo.ca/infosec/Policies/policy71.htm. For typical penalties check Guidelines for the Assessment of Penalties, www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm.

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Note for Students with Disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.