Spring 2024

Arch 314-002: Environmental Controll Systems II

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20ARCH 314 ENVIRONMENTAL CONTROL SYSTEMS II

Spring 2024
New Jersey Institute of Technology

Class Delivery Mode:	Hybrid with asynchronous online
Face-to-face Classroom Meeting:	Thursday, 10:00AM – 11:20 AM, WEST LECT 1
Asynchronous Online Activities:	Available on NJIT Canvas (https://canvas.njit.edu/)
Instructor:	Han Yan, Ph.D. han.yan@njit.edu
Office Hours:	By Appointment Only
Prerequisite:	ARCH 309 or ARCH 227

*This syllabus is an adoption of the course, ARCH 544G Environmental Control Systems II, designed by Prof. Hyojin Kim at NJIT

DESCRIPTION:

This course is intended to provide students a deeper understanding of the relationship between architectural design and active building systems. The topics include: indoor air quality and ventilation systems, heating and cooling systems, electric lighting design, electrical energy systems, acoustical systems, building water supply, plumbing systems, and fire protection. This course is the second of a two-course sequence in building environmental control systems (309, 314) focusing on active (mechanical/electrical) solutions, yet passive (architectural) solutions are covered in the first sequence.

COUSE LEARNING OUTCOMES

This course will guide students to achieve the following competencies:

- Explore active control systems contribute to the regulation of building environment.
- Establish basic terminology used in the field of active environment control systems.
- Understand the basic principles and major components of HVAC, mechanical, and plumbing systems in building.
- Able to identify and reference regulatory standards in the relative fields.

REQUIRED TEXT:

Mechanical and Electrical Equipment for Buildings (MEEB), 13th Edition, by Grondzik and Kwok (ISBN: 978-1-119-46308-5).

COURSE FORMAT:

This class is taught in a hybrid format. The class meet in person every Thursday from 10:00 AM to 11:20 AM throughout the semester. The in-person class time is for a brief review and Q&A of the course materials, individual/group lab activities, and exams. Online activities will be delivered asynchronously through NJIT Canvas. This includes watching lecture videos posted on Canvas and submitting one-minute papers. Students are required to watch the lecture videos before the respective in person session. Assignments will be posted on Canvas and expected to be completed by announced due time.

COPYRIGHT STATEMENT:

All materials in this course, including lecture videos, lecture slides, labs, assignments, exams, and related materials, are intended solely for the use of students currently enrolled in this course and solely for purposes related to this course. Students are strictly prohibited from sharing any of the course materials with third parties. These materials may be protected by copyright law, and any additional use beyond the scope of this course may constitute a violation of federal copyright law.

RECOMMENDED TEXT:

Heating and Cooling of Buildings, Design for Efficiency, 2nd Edition, by Kreider, Curtiss, and Rabl (ISBN: 978-1439811511).
The Green Studio Handbook: Environmental Strategies for Schematic Design, 3rd Edition, by Kwok and Grondzik (ISBN: 978-1138652293).
The Architect's Studio Companion: Rules of Thumb for Preliminary Design, 6th Edition, by Allen and Iano (ISBN: 978-1119092414).

PROFESSIONAL STANDARDS ADDRESSED

NAAB Criteria: The National Architectural Accrediting Board (NAAB) accredits NJIT's architecture program. The NAAB has criteria that must be covered by any architectural curriculum to attain their approval. This course directly addresses (all or in part) the following, as outlined in the NAAB Conditions for Accreditation:

> PC.3 Ecological Knowledge and Responsibility: How the program instills in students a holistic understanding of the dynamic between built and natural environments, enabling future architects to mitigate climate change responsibly by leveraging ecological, advanced building performance, adaptation, and resilience principles in their work and advocacy activities.
>
> SC.1 Health, Safety, and Welfare in the Built Environment: How the program ensures that students understand the impact of the built environment on human health, safety, and welfare at multiple scales, from buildings to cities.
>
> SC.4 Technical Knowledge: How the program ensures that students understand the established and emerging systems, technologies, and assemblies of building construction, and the methods and criteria architects use to assess those technologies against the design, economics, and performance objectives of projects.

ACADEMIC INTEGRITY:

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: https://www5.njit.edu/policies/sites/policies/files/NJIT-University-Policy-on-Academic-Integrity.pdf

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES:

All reasonable efforts will be made to accommodate a student with a temporary disability (e.g., broken arm, protracted illness, etc.) as long as the student is responsible for communicating with their instructor about the issue and for cooperating in its resolution. Students with more permanent physical or learning disabilities must provide documented requests for accommodation to their instructor at the beginning of the semester (or as soon as the disability is diagnosed and documented). Students should contact the office of Accessibility Resources at https://www.njit.edu/studentsuccess/node/5 for further information and instruction for obtaining medical and/or psychological disability documentation.

LEARNING AND TEACHING CULTURE POLICY:

In addition to the overarching values and ethics of the university, the New Jersey School of Architecture (NJSoA) is dedicated to optimism, diversity and solidarity, professional conduct, constructive evaluation and instruction, collaborative community, health and wellbeing, time management and school-life-work balance, respectful stewardship and space management, and well-rounded enrichment. The pedagogy of architecture and design is as complex as it is rewarding, and as dynamically evolving as the people who learn and teach it. This understanding resides at the core of the NJSoA Learning and Teaching Culture Policy: https://design.njit.edu/learning-and-teaching-culture-policy

OTHER POLICIES OR EXPECTATIONS:

Attendance: Attendance for both in person and online portion of the class are counted towards students' final grade. Online lecture attendance is recorded when student watch the pre-recorded lecture and complete one minute paper for each lecture. After the due date, no more submissions of one-minute papers are allowed, which will be counted as an ½ absence. Students are also expected to attend the face-to-face lab session, attendance are recorded which account for the other ½ attendance for the week. Excessive absences will not be tolerated and will result in a failing grade. This class allows two unexcused absences. Any additional unexcused absence will result in a 1/2 letter grade deduction to the final course grade per absence (e.g., B+ down to B).

When a student invokes extenuating circumstances for any reason (e.g., late withdrawal from a course, request for a make-up exam, request for an Incomplete grade), the student shall contact the course instructor immediately and will be sent to the Dean of Students Office. This includes medical or psychological documentation to support a student's claim. Students should not bring such information to their instructor, nor should it be requested by a faculty member. The Dean of Students will be making the determination of whether extenuating circumstances exist or not and will be notifying the instructor accordingly. Except for cases determined by law, an instructor is not required to accommodate student requests even when extenuating circumstances are certified by the Dean of Students; however, all efforts will be made to ensure a student-friendly environment.

LABS:

Labs are designed to reinforce the lecture concepts and to prepare students for the assignments. Labs are expected to be completed during face to face class time. Students are required to complete the labs and submit their lab deliverables in a SINGLE PDF file via Canvas by the announced due dates (i.e., 24 hours after the end of class) to receive a credit. You are allowed and encouraged to work in groups to obtain a better understanding of the lab. However, you have to turn in your own lab that you have worked on (see the definition of plagiarism on http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf)

ASSIGNMENTS:

All assignments will be posted on Canvas. Students are required to submit their completed assignments in a SINGLE PDF file to Canvas by the announced due dates (i.e., 11:59 PM on Wednesdays). Students should not email the assignments directly to the instructor. The instructor must be able to open and read the files. If the file is corrupt or illegible, and the instructor is unable to read the file, the student will receive a failing grade for that assignment. You are allowed and encouraged to work in groups to obtain a better understanding of the assignment. However, you have to turn in your own assignment that you have worked on (see the definition of plagiarism on http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf)

All questions requiring a short response should be answered with a concise, well-crafted paragraph.Answers should be typed, unless otherwise noted. If you are to fill in answers on the assignment sheets themselves, please turn in a clean, legible copy. Illegible answers will not receive credit. Successful presentations of assignments include, but is not limited to: spelling, clarity of thought, following instructions, and design. Points are awarded at the instructor's discretion. Show all calculations and include all units (e.g., Kilowatts = kW). Calculations may be handwritten, if presented legibly.

LATE WORK:

Students are required to submit all lab deliverables and assignments on time by the announced due dates via Canvas. Late work will NOT be accepted. Students may be allowed to make up missed work with an excused reason depending on the nature of extenuating circumstances that shall be certified by the Dean of Students as described above for Attendance.

COMMUNICATION DURING THE SEMESTER:

The instructor and Tas The instructor will use Canvas (https://canvas.njit.edu/) to post online lecture materials for the course. In addition to Canvas, email communication with students will be made by NJIT email only. Please check your NJIT email prior to each class for possible information pertaining to class. It is your responsibility to maintain your NJIT email account in working order and check it regularly. All emails you send should include "YourName_314-S24" on the email subject line and be sent to the course instructor.

RECORDING OF CLASSES:

Students are not allowed to record the class sessions in any manner without the permission of the course instructor.

EXAMS:

There will be two exams that cover the material indicated, which will be given on announced exam days. The exams will be open-book, open-note. Laptops are allowed only to open the Canvas Quiz browser and access downloaded e-textbook/course materials. You are NOT allowed to access to any other browser windows (e.g., course materials posted on Canvas) during the exam. Cellphones and/or other small-sized electronic devices that are capable of sending/receiving electronic messages are NOT allowed.

FINAL:

There will be a comprehensive final exam that will cover all the material presented in this class. The same policies described above for Exams will be applied to the Final.

CHANGES TO THE SYLLABUS:

Any changes that are made to this syllabus after it has been distributed to students on the first day of class will be made as an addendum and will be promptly distributed to the students. Students are expected to read and abide by all of the information contained in this document.

ASSESSMENT

The weighting of various components of the course grade will be as follows:

Attendance	5%
Labs	10%
Weekly assignments	25%
Exam 1	15%
Exam 2	15%
Final exam	30%

Grades will not be rounded up. Your final course grading based on the University grading system for graduate students will be as follows:

A	Superior	90.0% and above
B+	Excellent	85.0% to < 90.0%
B	Very Good	80.0% to < 85.0%
C+	Good	75.0% to < 80.0%
C	Acceptable	70.0% to < 75.0%
D	Minimum	60.0% to < 70.0%
F	Inadequate	< 60.0%

COURSE SCHEDULE

Wk 1. 1/18/2024 In person Lecture Course overview / Introduction

Wk 2. Online: Lecture1: IAQ and ventilation (complete by 1/25)
1/25/2024 In person Lab 1: Ventilation rate calculation
Assignment 1 Issued

Wk 3. Online: Lecture 2: HVAC psychrometric processes (complete by 2/1)
2/1/2024 In person Lab 2: HVAC Psychrometric analysis
Assignment 2 Issued

Wk 4. Online: Lecture 3: Basic HVAC system operation (complete by 2/8)
2/8/2024 In person Lab 3: Spatial requirements for HVAC operation
Assignment 3 Issued

Wk 5. Online Lecture 4: HVAC system types (complete by 2/15)
2/15/2024 In person Exam 1 Review

Wk 6. 2/22/2024 Exam 1
Online Lecture5: HVAC distribution systems (complete by 2/22)

Wk 7. Online: Lecture 6: Light sources / Lighting design (complete by 2/29)
2/29/2024 In person Lab 4: Illuminance calculations

Assignment 4 Issued

Wk 8. Online: Lecture 7: Lighting design / Lumen method (complete by 3/7)
3/7/2024 In person Lab 5: Lumen method
Assignment 5 Issued

Spring Recess

Wk 9. Online: Lecture 8: Electricity basics / Electric systems (complete by 3/21)
3/21/2024 In person Lab 6: Power calculations
Assignment 6 Issued

Wk 10. Online: Lecture 10: Electrical systems / Wiring design (Completed by 3/28)
3/28/2024 Exam 2 Review

Last Day to Withdraw (4/1/2024)

Wk 11. 4/4/2024 Exam 2
Online: Lecture 11: Acoustics fundamentals (complete by 4/4)

Wk 12. Online: Lecture 12: Noise control / Room acoustics (complete by 4/11)
4/11/2024 In person Lab 7: Carbon footprint calculations
Assignment 7 Issued

Wk 13. Online: Lecture 13: Water supply / Water distribution systems (complete by 4/18)
4/18/2024 In person Lab 8: DHW Sizing
Assignment 8 Issued

Wk 14. Online: Lecture 14: Water distribution / Fire protection (complete by 4/25/2024)
4/25/2024 Final Exam Review

Wk 16. Final Exam (TBD)