1. Course Basics

Course Name: **ENVIRONMENTAL SYSTEMS II**

Course Number: **ARCH373**, Section: **3**, CRN: **25418**, Semester: **Fall**, Year: **2025**

Class meeting days and times:
ARCH373 – Section 3 (CRN-25418) | 20 students
Classroom: AB 403
Class meeting times: Mondays/ Wednesdays 9:00 am-10:15 am

2. Instructor Information

Instructor:
Zahida Khan, Ph.D., LEED AP BD+C
Department of Architecture
Ball State University, Muncie, IN
Email: zahida.khan@bsu.edu
Office tel: 765-285-3481
Office Hours: By appointment via email
Note: Instructors will typically respond to email within 24 hours M-F, 48 hours on weekends
Graduate Assistant (GA):
Kriti Manandhar
Email: kriti.manandhar@bsu.edu
Office Hours: By appointment via email

Welcome everyone to course ARCH373: Environmental Systems II. This is identified as one of the core STEM courses in the BArch program curriculum. The idea is that you learn and apply various environmental control systems in building design with a global goal of ensuring (1) improved occupant health and safety, (2) uplifted quality of life of the community, and (3) advocate for climate-conscious design as a responsible future architect.

The course will emphasize environmental control concepts in buildings through a hands-on learning approach, which is highly effective for STEM education. To implement this, we will participate in the real project titled *"Post Occupancy Evaluation Study of Indoor Environmental Quality and Occupant Behaviors"*, funded by Ball State University (BSU) Immersive Learning Provost Sustained Grant. Our community partner, the College of Architecture and Planning, is committed to enhancing the student experience. Together, we will assess indoor environmental quality and occupant behavior in selected areas of the Architectural Building (AB) at BSU.

The knowledge gained from this course not only deepens your understanding of concepts but also offers valuable insights into conducting scientific research within architecture. Research plays a crucial role in driving design innovation. This project serves as a bridge between research and design, particularly within the scientific aspects of the architectural discipline.

Additionally, the project will also help you prepare for your career by mimicking a real professional setting that involves various stakeholders. We will regularly interface with designated officials from the College of Architecture and the Operations and Facility Management team.

3. Course Information

University Course Catalog Description:
Application of the principles of physics to the design and engineering of environmental systems in buildings and technologies of active intervention.
Prerequisites:
ARCH 273
Open only to B. Arch; BA/BS architecture; BA/BS environmental design

Course Description:
Building environmental control systems, both active and passive, are essential for enhancing occupant comfort, health, and safety, thereby increasing the building's utility. This course will focus on "active systems" for environmental control, including HVAC systems, electric lighting, fire protection, sanitation, electrical systems, and mechanized circulation systems. While well-designed buildings often incorporate passive systems (discussed in ARCH 273) to complement active systems, in minimally code-compliant buildings, the design team may rely heavily on active systems to ensure occupant comfort and safety. The selection of these systems is crucial as it impacts building energy consumption. By evaluating their performance, we can gain valuable insights into both energy usage and occupant behavior.
In this course, we will evaluate indoor environmental quality, energy consumption, and occupant behavior in selected areas of the Architecture Building at BSU using a real building project. Working in teams, we will measure, analyze, document, and share the performance of these spaces with the community. As part of this immersive learning experience, you and I will collaborate with community partners to obtain regular feedback and find solutions to environmental control challenges in buildings.
Engaging with a community partner on a real-world problem will create active learning opportunities, promoting student interaction, peer collaboration, and a deeper understanding of the topic. This immersive course will help you develop essential scientific research skills and prepare you for your future career.

Course Objectives:
<u>Course Goals:</u>
The systems covered in this course are crucial across all building types, significantly impacting both initial and life-cycle costs, functional performance, and occupant health, safety, comfort, and productivity. Environmental control systems account for a substantial portion of building energy use and can be effectively utilized to advance goals such as green, net-zero-energy, and carbon-neutral buildings. A project architect must understand active systems thoroughly to engage with consultants effectively, ensuring these systems are integrated cohesively into building designs.
Since these systems will be part of nearly every building you design, it's essential to align them with architectural goals. This course aims to provide a solid understanding of active building environmental control systems and their application in various building types. Specifically, it will introduce you to the objectives and functions of these systems, their major components, key design concepts, common analysis techniques, and concerns related to system integration.

Course Learning Outcomes:

The course learning outcomes are listed below

1. Teamwork: Students will create a constructive collaborative climate (collaboration)
2. Knowledge: Students will be able to know
    a. the basic terminology, performance metrics, building codes, and standards
    b. the key system functions—what various systems can and cannot do
3. Comprehension: Students will be able to comprehend
    a. the fundamentals of system components, selection, sizing, placement, and integration
    b. the impact of such systems within the premise of a broader environmental, social, and economic context and initiatives
4. Application: Students will be able to understand the place of such systems in typical building contexts—including high-performance building design efforts
5. Critical thinking: Students will
    a. apply previous knowledge or skills to demonstrate comprehension and performance in novel situations (transfer)
    b. develop a mindset focused on thoroughly exploring issues, ideas, artifacts, and events before forming or accepting an opinion or conclusion.
6. Analysis & Evaluate: Students will be able to make preliminary decisions regarding the appropriateness of various systems and design concepts during a project's conceptual and schematic design phases
7. Synthesis: Students will be prepared to engage active systems relative to emerging practice trends such as commissioning, integrated design, and building information modeling.
8. Inquiry and Analysis: Students will conduct research in a systematic manner involving explorations, field measurements, and data analysis processes. Measuring building performance through field measurements and analyzing the collected data will help in making informed conclusions or judgments.
9. Oral Communication: Students will present their findings to the community partner in a structured way designed to get constructive feedback, increase knowledge, and foster understanding.

NAAB Criteria:

Additionally, the course contributes to the **NAAB criteria**. NAAB (National Architectural Accrediting Board) Conditions for Accreditation establish two types of performance (outcome) evaluation criteria. Program Criteria (PC) are collectively addressed by a curriculum. Student Criteria are addressed by one or more courses within a curriculum and are valuation by NAAB using both course artifacts (lectures, exams, assignments) and student work examples. Student work is evaluated by NAAB at two levels: understanding (typical actions: classifying, comparing, contrasting, explaining, identifying) and ability (typical actions: choosing, constructing, implementing, judging, using). The explicit criteria expectations for ARCH 373 follow.

- 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.

- PC.5 RESEARCH AND INNOVATION
  How the program prepares students to engage and participate in architectural research to test and evaluate innovations in the field.

- SC.1 HEALTH, SAFETY, AND WELFARE IN THE BUILT ENVIRONMENT (Understanding)
  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(Understanding)
  How does the program ensure 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.

- SC.6 BUILDING INTEGRATION (Ability)
  How the program ensures that students develop the ability to make design decisions within architectural projects while demonstrating the integration of building envelope systems and assemblies, structural systems, environmental control systems, life safety systems, and the measurable outcomes of building performance.

Course Modality / Structure:
All classes will be held in person during the time and place listed above. Classes will comprise lectures, team-based hands-on learning activities (workshops, discussions, and field trips), and reviews involving community and industry partners. Attendance and participation will be important. This course is structured around the belief that learning is an endeavor that requires invested engagement. Active systems are a vital part of architecture. The systems learned in this course must not be limited to the class work. You must apply the learnings by integrating them into the design process to understand their concept holistically. Begin with applying them in your studio design projects and later in professional practice.
It is often presumed that in a professional program such as architecture, a student will spend around 3 hours per week per credit on independently scheduled activities (such as reading, completing assignments, studying, and preparing for exams). In addition to typical university fees and book expenses, nominal additional costs will likely be incurred for materials and supplies required for the completion of certain assignments.

4. Course Materials

Required readings include *Mechanical and Electrical Equipment for Buildings, 13th edition*: Grondzik and Kwok; John Wiley & Sons, Hoboken, NJ, 2019. (Listed as **MEEB** in the schedule).
Refer to the link “Reading list” on Canvas
https://bsu.alma.exlibrisgroup.com/leganto/public/01BSU_INST/lists?courseCode=202410.36705.ARCH.373.7.M.01.CLAS&auth=SAML
Additional Resources:
The following resources may prove useful should you wish to delve deeper into environmental control systems for buildings (or to get a different perspective on basic issues).

- Egan, M.D., 2007. Architectural Acoustics. J. Ross Publishing.
- Heschong, L., 2021. Visual Delight in Architecture: Daylight, Vision, and View. Routledge.

- Heschong, L., 1979. Thermal Delight in Architecture. The MIT Press.
- Kwok, A., Grondzik, W., 2018. The Green Studio Handbook: Environmental Strategies for Schematic Design. Routledge.
- Lechner, N.M., Andrasik, P., 2021. Heating, Cooling, Lighting: Sustainable Design Strategies Towards Net Zero Architecture, 5th Edition | Wiley, 5th ed. John Wiley & Sons, Ltd.

5. Course Assignments and Assessments

Student performance in this course will be assessed using a variety of measures, namely assignments, reading assessments, and attendance & participation. These diverse assessments are designed to accommodate different learning styles and offer a comprehensive view of each student's grasp of key concepts and their ability to apply them in design scenarios. All course assignments must be submitted by their respective deadlines. The assessment methods include:

<u>Assignments (Research & Design Projects)</u>
Assignments will be distributed throughout the semester, each with a detailed description and a specific due date. You will find these assignments on Canvas, and there will be ample opportunity to ask questions before each deadline. These assignments are designed to encourage critical thinking and reflection, testing your ability to apply concepts and conduct research within given contextual constraints. They also serve as essay-style exams, so you are expected to incorporate relevant concepts and terminology from the course into your submissions. There will be two research projects and two design projects. These projects are team-based and will involve peer assessments. Research projects involve (a) energy research using real-time data, and (b) Indoor Environmental Quality (IEQ) research using environmental monitoring. Design projects involve (a) luminaire prototype design, and (b) Building design.

<u>Reading Assessments (RA):</u>
Canvas-based reading assessments (quizzes) are a key component of the course grading system and serve as a pacing mechanism to ensure timely completion of modules. These assessments typically consist of five questions designed to gauge your understanding of the required course readings. The reading assessments are open-book.

<u>Attendance and Participation.</u>
Participation is important in this course. Participation assessment will follow the rubric below

Exceptional (100%)	Above average (85%)	Average (55%)	Below average (25%)	Unacceptable (0%)
exceptional performance by leading the discussion beyond the given topic whilst demonstrating novel knowledge	excellence in a topic-based discussion expected at the graduate level with a sufficient research base	sufficient contribution to the class discussion while demonstrating a good understanding of the assigned topic.	limited contribution to the class discussion demonstrating a sparse understanding of the assigned topic.	does not contribute to class discussions.

Note: Assignment details, including instructions, relevant readings, due dates, and grading criteria/rubrics will be posted and updated on Canvas. Please check Canvas regularly to stay informed and on track.

The overall semester course grade will be based upon a cumulative tabulation of the various course performance elements described above. These will be weighted as per the following schedule.

	points	percentage
Assignments (research projects)	80	29%
Assignments (design projects)	90	33%
Reading Assessments	75	27%
Peer/Team Evaluation*	16	6%
Attendance & Participation	14	5%
Total	**275**	**100%**

*Peer Evaluation is based on the "Fink's Method" developed by Dr. L Dee Fink and published in "Team-Based Learning: A Transformative Use of Small Groups in College Teaching".
Assignments that require peer evaluation will consider each team member's contribution to the group. The final grade will be composed of 75% based on the actual grade and 25% based on peer scores, which are calculated using Fink's method.

Assignments must be submitted electronically in Portable Document Format (PDF); other file types will not be accepted unless specified otherwise. Each assignment should be submitted as a single file—multiple files will not be accepted. It is your responsibility to ensure that the files you submit are complete, readable, and have been successfully uploaded to Canvas. Name your files according to this format: 373-x-nnn, where "nnn" is your last name and "x" is the assignment number (e.g., 373-AS01-Tull). Adherence to this naming convention is required unless otherwise noted. Please upload assignments directly to Canvas as files, not as links to cloud storage.

Work must be submitted in a format that demonstrates your status as an undergraduate student in a professional design program. This includes ensuring that your work is legible, well-organized, and free of spelling and grammatical errors. Be sure to document all specific data sources and any assumptions made during the completion of assignments. Double-check all mathematical calculations and use explicit units to enhance accuracy. The quality of the general presentation will impact your grade, as will the accuracy and completeness of the content. Additionally, retain a copy of all assignment files in case of transmission issues.

All submitted work— including conclusions, solutions, and calculations— must be your own intellectual effort. Your work should reflect your judgment regarding accuracy, quality, completeness, and presentation. Using another person's work or any part of it as your own will result in a failing grade for the assignment and could lead to a referral for academic honesty violations.

To encourage a professional approach to planning and completing work, all assignment due dates will be strictly enforced. Late submissions will be graded according to the **late assignment policy** outlined in a subsequent section. Consistently submitting late work will significantly impact your course grade. However, submitting one or two assignments slightly late due to conflicting demands is generally acceptable. Overall, maintaining consistent timeliness is more important than occasional delays.

Grading Scale

Grades in this course are not curved. Final letter grades will generally follow the University's +/- grading scale as shown below

BSU Final letter grade scale

A	94% & above	C	74% – 77.99%
A-	91% – 93.99%	C-	71% – 73.99%
B+	88% – 90.99%	D+	68% – 70.99%
B	84% – 87.99%	D	64% – 67.99%
B-	81% – 83.99%	D-	60% – 63.99%
C+	78% – 80.99%	F	< 60%

If unforeseen and/or uncontrollable circumstances during the semester make it impossible for you to fully participate in course activities as scheduled, such a situation must be brought to the instructor's attention immediately. Delayed requests for compassionate consideration will not be accepted. Any request for a deviation from published and/or assigned course requirements due to a situation beyond your control (extended illness or similar) must be made on time and be agreed to in writing.

6. University Policies and Statements

University Statement

We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse. If you need course adaptations or accommodations because of a disability, please contact the instructor of record as soon as possible. Ball State's Disability Services Office coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or dsd@bsu.edu.

Freedom of Expression

In this course, we are committed to fostering a learning environment that values intellectual diversity, encourages free expression, and promotes open inquiry. As members of the Ball State Community, we treat each person in the Ball State community with civility, courtesy, compassion, and dignity and respect and learn from differences in people, ideas, and opinions. Please review Ball State University's Statement on Freedom of Expression, the resources on Ball State's Freedom of Expression webpage, and Ball State's Beneficence Pledge.

Attendance

- Class attendance is mandatory. Tardiness and early leave are counted as half an absence.
- **Excused absences** will be as per the University policies regarding student absences. Absences will be excused for the following: funeral and bereavement leave, jury duty, late course addition, military absences, observance of religious holidays, pregnancy leave, student-athletes participating in University- or department-approved activities, and university advisories. **For an absence to be excused, the students must submit proper documentation**.
- **Four (4) unexcused absences** will result in an automatic reduction of your final grade by a half grade (e.g. a B+ will be a B-). It is your responsibility to keep track of your absence

record. This will occur until 6 absences when the student fails the semester. You will not be notified of this record; however, you will get an update upon request through email. The grade reduction will occur at the end of the semester before grades are submitted and not when they occur. As such, you will not see these grades in the Canvas grade book.

7. Student Support Services

The Learning Center
The Learning Center offers free Tutoring and Academic Coaching for many courses at Ball State. Students can make appointments for online (Zoom) or in-person (NQ 350) appointments. To make an appointment, visit myballstate.bsu.edu and click on “Navigate” in the Academic Tools section, or just go directly to bsu.navigate.eab.com.

Testing accommodations for students with disabilities are available for students who have received the appropriate documentation from Disability Services. Tests may be administered in the Learning Center. Supplemental Instruction is available in select courses. If you have an SI leader for your course, that person will provide students with information the first week of school regarding weekly study sessions. For more information about Learning Center programming, visit bsu.edu/learningcenter or call 765-285-1006. Follow us on Instagram: BallStateLC.

The Writing Center
All writers improve with practice and feedback, so as a student in this course, you are encouraged to use the Writing Center (in Robert Bell 295 during weekdays, Bracken Library First Floor West in the evenings, or online during any of our regularly scheduled hours) to get additional feedback on your writing.
The Writing Center offers free planning, feedback, and accountability sessions (in person and online) to all students composing essays, reports, reflections, research projects, web content, lesson plans, slideshows, poster presentations, resumes, and other digital or print texts. To schedule a free appointment to discuss your writing, go to bsu.edu/writingcenter. Online and in-person appointments are available; however, plan ahead because appointments book quickly!

The Basic Needs Hub
If you are having difficulty affording enough food, do not have a safe and reliable place to sleep, and/or experiencing an emergency or crisis, help is available through the Basic Needs Hub. The Basic Needs Hub has information, resources, and provides individualized support to students. To talk with a supportive staff member about your experience, receive one on one assistance, or learn more about resources, you can submit a Basic Needs Assistance Form.

The Counseling Center
The Ball State University Counseling Center offers free and confidential services to all students. The Counseling Center is located in Lucina Hall, Room 320. To schedule an appointment, you can contact us at 765-285-1736. Ball State also offers a 24/7 Crisis Line, which can be reached at 765-285-HOPE (4673). The Crisis Line is a mental health resource for those who are struggling with any mental health concerns, including thoughts of self-harm and/or suicide.

At the Ball State Counseling Center, we see students for a variety of reasons, some of which include homesickness, relationship concerns, anxiety, and depression. At your first appointment, you will work with a therapist to create a plan that will connect you with resources that best fit your needs. We assist students with getting connected to therapy at our Center as well as connecting students to self-help resources, other on-campus resources, and community-based resources. All Ball State students also have access to several on-demand, self-help resources through a variety of different platforms. All of these resources, including a direct link to our website, can be found here.

The Speaking Center
The Speaking Center is a free resource available to all members of the BSU community wanting to improve their public speaking abilities. We offer personalized coaching designed to help you become a more confident and effective speaker. Our trained coaches provide constructive feedback and support throughout the entire speech preparation process, whether you are in the early stages of brainstorming ideas and organizing your thoughts or you need to practice your delivery and refine your message.

The Center is in the David Letterman Communication and Media Building, room 302. To schedule an appointment, please access us through your Navigate app or use this direct link to sign up for a time. Appointments are available both in person and on Zoom. Appointments are available in person, on Zoom, and in virtual reality (VR) for those interested in practicing in an immersive speaking environment.

8. Canvas and Student Privacy

Canvas Accessibility
Canvas provides a user experience that is easy, simple, and intuitive. Special attention has been paid to making the Canvas screen readable. The Rich Content Editor encourages users to create accessible content pages (i.e., text formatting is accomplished using styles). Canvas is designed to allow limited customization of colors and schemes to be accessible for all users. The National Federation of the Blind granted Canvas the Gold Level Web Certification in 2010.
Find more information by visiting the Canvas Voluntary Product Accessibility Template (VPAT).

FERPA and Privacy
As a student, your educational records are considered confidential. Under FERPA (Family Educational Rights and Privacy Act), your records are confidential and protected. Under most circumstances, your records will not be released without your written and signed consent. However, some directory information may be released to third parties without your prior consent unless a written request to restrict this is on file. You can learn more about student rights to privacy by reading Ball State's FERPA and Privacy and Protection.

Video Conferencing Recording
In this class, software may be used to record live class discussions. As a student in this class, your participation in live class discussions may be recorded. These recordings typically will be made available only to students enrolled in the class, to assist those who cannot attend the live session or to serve as a resource for those who would like to review content that was presented. Students who prefer to participate via audio only will be allowed to disable their video camera so only audio will be captured. Students who prefer to listen only must disable their audio capability and visual camera. If you have concerns, please discuss these options with me.

Plagiarism Detection

The campus subscribes to Turnitin, a plagiarism prevention service, through Canvas. You may need to submit written assignments to Turnitin. Student work will be used for plagiarism detection and for no other purpose. The student may indicate in writing to the instructor that he/she refuses to participate in the plagiarism detection process, in which case the instructor can use other electronic means to verify the originality of their work.

9. Course Expectations and Policies

Course Participation Expectations

- This course is designed with weekly activities, discussions, and other forms of regular collaboration and communication.
- It is recommended that you log into your course 3 to 4 times a week and check your official Ball State email account daily to view announcements and prepare for class.
- Complete all assignments, quizzes, tests, and any other activities by the stated due dates.
- If unforeseen and uncontrollable circumstances make it impossible for you to fully participate in course activities as scheduled, such a situation must be brought to the instructor's attention immediately. Delayed requests for consideration of such events will not be accepted. Any request for a deviation from the published due dates must be made promptly and be agreed to in writing. A grade of 'I' (incomplete) will only be considered under the conditions outlined under university policies – i.e., unavoidable, extraordinary circumstances beyond the control of the student.

Feedback Policy

- I will respond to emails from your official Ball State email address within 24 hours during weekdays (Monday-Friday) and within 48 hours on the weekend.
- I will grade your quizzes and assignments as per the schedule.
- Contact me directly if you have questions or concerns about your performance in class.

Late Assignment Policy

- All assignments are due by midnight EST/EDT time on the due dates indicated.
- Late assignments will be considered only after prior approval from the instructor. Late work will be accepted up to seven days after the published due date but with **a penalty of 5% per day.**
- Internet connectivity and technical issues may occur and impede you from turning in work on time. Turn in work early and often, and set up a backup plan, such as visiting a local library or borrowing a peer's computer.
- You have one (1) permitted late assignment to allow for these issues, to which you can turn in one assignment 24 hours late.
- Canvas will NOT accept assignments for grading after 11:59 pm on the final day of class.

Assignment Submission Policy

- All assignments should be submitted as Word documents with extensions of .doc or .docx unless otherwise indicated in the assignment description.

- Assignments, unless otherwise indicated, should be submitted using the assignment link in the module.
- Refer to the Assignment part of the Grade Distribution section of this syllabus for further details.

Grading Policy

- It is my policy that appropriate evaluation of your academic performance is an integral part of your learning experience.
- In the absence of mistakes, fraud, bad faith or incompetence, I will be the key decision-maker on the assignment of grades.

Engagement Expectations

To support a respectful and engaging academic community that encourages the free exchange of ideas and civil discourse, we will follow these ground rules:

- *Respect different perspectives.* Share your ideas and let others share theirs.
- *Challenge ideas, not people.* Disagree respectfully. No personal attacks or put-downs. Focus on exploring ideas critically and constructively.
- *Listen to understand.* Stay curious, ask questions to understand, and give others space to speak.
- *Assume good intentions.* Approach discussions with curiosity and compassion.
- *Keep it private.* What is shared in class stays in class. Do not share others' words or work without permission.
- *Be respectful.* Avoid hurtful language, stereotypes, or content that may demean others. Keep feedback constructive.

10. Course Schedule

To support a learning experience that is responsive to the needs, interests, and pace of our class community, the course schedule may shift over the semester. The most current version of the schedule will always be available on Canvas. I encourage you to check Canvas regularly for updates and contact me if you have any questions.

Tentative Course Schedule
Fall 2025

Wk	Date	Description	Required Reading	Tentative due dates (confirm on Canvas)
1	M 08/18	Introduction & Syllabus	Syllabus on Canvas	
	W 08/20	Thermal Comfort (applied psychrometrics) Indoor Air Quality	MEEB 115-136, MEEB 536-541 & 1757 MEEB 137-175; Refer to Standard 62.1	
2	M 08/25	Envelope Design HVAC Overview HVAC Preliminary space design HVAC Systems	MEEB 277-287 / MEEB 288-316 MEEB 531-544 MEEB 544-547 MEEB 605-607	**RA01 due**
	W 08/27	HVAC Components: Source HVAC Components: Distribution HVAC Components: Delivery / Control	MEEB 547-583 MEEB 583-593 MEEB 594-605	
3	M 09/01	LABOR DAY		**RA02 due**
	W 09/03	field trip (geothermal plant)	MEEB 683-690	**AS00-POE**
4	M 09/8	field trip (geothermal plant)	MEEB 683-690	**RA03 due**
	W 09/10	Energy		
5	M 09/15	HVAC Systems: large & small bldgs	MEEB 607-683	**RA04 due**
	W 09/17	**Review 01 - Energy Research (ER)**	**Gallery Style**	**AS01 ER; PR-1**
6	M 09/22	Electrical System Overview	MEEB 1258-1373	**RA05 due**
	W 09/24	Electric Lighting Overview; Electric Lamps & Luminaire	MEEB 221-222 and 759-771; MEEB 699-746	
7	M 09/29	Electric Lighting Controls	MEEB 747-758, MEEB 771-811	**RA06 due; AS02-LD01**
	W 10/01	Electric Lighting Analysis (zonal cavity method)		**AS02-LD02**
8	M 10/06	FALL BREAK		**RA07 due**
	W 10/8	LD luminaire: Dsicussion/Testing		
9	M 10/13	LD luminaire: Dsicussion/Testing		**RA08 due**
	W 10/15	**Review 02 - Luminaire Design (LD)**	**Gallery Style**	**PR-2** **AS02-LD03 & LD04**
10	M 10/20	FIELD TRIP WEEK		
	W 10/22	FIELD TRIP WEEK		
11	M 10/27	Photovoltaic & Solar Thermal Systems	MEEB 935-947, 1423-1444	
	W 10/29	Fire protection OPR & Overview	MEEB 1178-1190; MEEB 1196-1222	
12	M 11/03	Smoke Control Overview	MEEB 1191-1196	**RA09 due**
	W 11/05	Plumbing; Water supply & Sewage, fixtures	MEEB 855-866, 897-935 & 948-1013	
13	M 11/10	Rainwater & Stormwater Management	MEEB 866-890, 987-1013, 1025-1051	**RA10 due**
	W 11/12	**Review 03 - Building Design (BD)**	**Class presentation**	**AS03 BD part 2**
14	M 11/17	Mechanised circulation	MEEB 1486-1584	**RA11 due**
	W 11/19	Acoustics; Building Commissioning	MEEB 1157-1168; ASHRAE handbook	**PR-3**
15	M 11/24	IEQ Measurements (part 1)		**RA12 due**
	W 11/26	THANKSGIVING BREAK		
16	M 12/01	IEQ Measurements (part 2)		**RA13 due**
	W 12/03	**Review 04 - IEQ Research**	**Gallery Style**	**PR-4; AS04 - IEQ**
17	M 12/08	last day of class		**RA14 due**
	W 12/10	exam week start (12/09)		**RA15 due**
	MEEB	Mechanical and Electrical Equipment in Buildings by Grondik & Kwok		
	RA00	reading assessment		
	AS00	assignment		
	xxx	Active learning		
	PR-x	peer/self review		
	ASHRAE 62.1	https://www.ashrae.org/technical-resources/standards-and-guidelines		

11. Subject to Change Statement

This syllabus and schedule are subject to change in the event of extenuating circumstances.