

University of Maryland, College Park
Mechanical Engineering Departments
ENME 742 / ENME 424 – Urban Microclimate and Energy
Spring Semester 2021

Instructor: Dr. Jelena Srebric, Email: e-city@umd.edu
Lectures: Tuesdays/Thursdays, 12:30-1:45 p.m.
Office Hours: TBD, Zoom Meetings
Online Attendance: Lectures in Zoom (see canvas)

Course Description:

Co-requisite: ENME332. Recommendation: ENME423.

This course examines urban microclimate from the perspective of transient heat and mass transfer using building energy simulations for building clusters. The focus is on understanding building energy consumption and environmental impacts from the individual building scale ($\sim 10^0$) to a neighborhood scale ($\sim 10^3$). Emerging morphological properties of building clusters modulate transient convective and radiative heat transfer resulting in different local microclimatic conditions. At the neighborhood scale, these conditions are analyzed using heat and mass transfer simulations in building clusters to provide boundary conditions for transient building energy simulations. At the individual building scale, besides the energy consumption, this course examines connection between indoor and outdoor environments.

TENTATIVE LECTURE SCHEDULE	Date	Week #
• Introduction to Course Objectives and Moist Air Properties (HW#1)	01/26	1
• Review of Air-Conditioning Processes	01/28	1
• Mechanical System Design Conditions (HW#2)	02/02	2
• Indoor Environmental Conditions	02/04	2
• Complete System Analyses (HW#3)	02/09	3
• Problem Solving Session of Complete Systems	02/11	3
• Exam 1	02/16	4
• Building Energy Simulations (<i>training for the project</i>) (HW#4)	02/18	4
• Project Assignment	02/23	5
• LEED Rating Systems (LEED-NC and LEED-ND)	02/25	5
• LEED Rating Systems (LEED-NC and LEED-ND) (HW#5)	03/02	6
• Troubleshooting Building Energy Simulations – Project Part 1	03/04	6
• Building Environmental Impacts (project deliverable #1)	03/09	7
• Building Life Cycle Assessment (HW#6)	03/11	7
Spring Break	03/16	8
Spring Break	03/18	8
• Urban Surface Energy Balance and Material Properties	03/23	9
• Urban Heat Island and Outdoor Thermal Comfort (HW#7)	03/25	9
• Problem Solving Session of Surface Energy Balances	03/30	10
• Exam 2	04/01	10
• Building Energy Simulations – Project Part 2	04/06	11
• Urban Terrain and Building Energy Balance (project deliverable #2)	04/08	11
• Building Surface Energy Balance (HW#8)	04/13	12
• Problem Solving Session of Surface Energy Balances	04/15	12
• Neighborhood Wind Effects on Building Energy Consumption (project deliverable #3)	04/20	13

• Neighborhood Solar Effects on Building Energy Consumption (HW#9)	04/22	13
• Model Calibration Approaches – Project Part 3	04/27	14
• Sustainable Building Enclosure (HW#10) (project deliverable #3)	04/29	14
• Project Presentations – Part 1 (presentation file due on 05/03)	05/04	15
• Project Presentations – Part 2 (presentation file due on 05/03)	05/06	15
• Exam 3	05/11	16

GRADING

Three Exams 50% (each exam is 25%)
Course Project 50%

Tentative Grading Scale:

A+: 100-96, A: 95-92, A-: 91-90; B+: 89-87, B: 86-83, B-: 82-80; C+: 79-77, C: 76-73, C-: 72-70; D+: 69-67, D: 66-63, D-: 62-60; F: below 60

Note: The above grading scale is meant to serve as a guideline.

Homework:

Homework sets will be assigned based on lecture coverage. Solutions will be made available on the Canvas. These assignments **are not graded**, but they are useful in preparations for the exams and the project.

Course Project:

The course project focuses on UMD campus building microenvironment and energy consumption. The project has three deliverables described in the project assignment document.

Academic Honesty:

All students are expected to uphold the highest ethical and professional of academic honesty (see the University of Maryland Code of Academic Integrity). A violation of the UMD Code of Academic Integrity includes (but is not limited to) intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise. Please be advised that a failure to accept and exhibit the fundamental value of academic honesty may result in a course grade of 'XF'.

Course Website:

We will use ELMS (<https://myelms.umd.edu/>) as the primary site to archive lecture notes and course related materials and share information.

Arrangements for Students with Disabilities:

The University of Maryland is obligated to provide appropriate accommodations for any student with documented disabilities. University policy objective is to maintain consistent program requirements and academic standards for all students while allowing suitable flexibility in the assessment arrangements for students with disabilities. However, it is the responsibility of each student to bring his/her special needs to the attention of the instructor.

Topics & Lecture Dates:

Tentative lecture and the exam dates are given in the course lecture schedule (above). If there is any change in the exam dates, students will be informed at least one week in advance.