Instructor: Burak Gunay, PhD, PEng
Office: CB 5206
Office Hours: Mon 9:00 am to 10:00 am and Thu 4:30 pm to 5:30 pm
Email: burak.gunay@carleton.ca

Teaching Assistants
TBA

Lectures at Southam Hall Room 624 – Thursday 11:35 am to 2:25 pm
Laboratory and tutorials at CB 5301

Learning Objectives:
1. Understand metrics and methods to assess building performance
2. Understand integrated design process
3. Apply design principles for high-performing envelopes
4. Understand fundamentals of solar geometry and design of fixed shading systems
5. Understand principles of lighting and daylighting design
6. Perform steady-state thermal analysis
7. Understand common HVAC and building-integrated renewable energy systems

Supplementary text:

Software:
LBNL Therm
LBNL Window
LBNL Comfen
UCLA Climate Consultant
eQUEST

Course Plan:
Week 1: High performing buildings
• Energy performance
  – Impact of building sector on energy use
  – GHG emissions from the building sector
  – Overview of energy codes and standards
• Comfort performance
– The four elements of comfort
– Link between comfort and productivity & satisfaction
– Overview of comfort standards

• Course objectives

Week 2a: Integrated design process
• Defining design objectives and integrated design process
• Design charrettes

Week 2b: Weather and climate
• Degree days and climate zones
• Weather data for building performance analysis
• Climate change and its effects on building performance

Week 3 to 5: Envelope
• Opaque components
  – R-value, insulation materials
  – Thermal mass
  – Airtightness and natural ventilation
• Windows
  – SHGC, U-value, visible transmittance
• Shading systems
  – Sun path diagrams
  – Overhangs, louvers, and side-fins
• Principles of passive solar design
  – Case studies: thermal mass use, fixed shading use, natural ventilation features

Week 6: Midterm

Week 7 and 8: HVAC
• Definition and functionalities of high performing HVAC systems
  – Chillers, boilers, AHUs, VAVs, Radiators
  – COP, efficiency, heat recovery, economizer
• Steady-state load calculations
  – Psychrometric chart
  – UA value
  – Infiltration and ventilation losses
  – Solar heat gains
  – Casual heat gains

Week 9: Renewable energy systems
• BIPV systems
• Solar thermal systems
• Geothermal systems
• Others (wind and bioenergy)

Week 10 and 11: Lighting and daylighting
• Daylight design features
• Lighting metrics
• Daylight performance metrics
• Daylight-integrated lighting controls

Week 12: Exam practice

Grade Distribution:
Midterm 25%
Class participation based on reading assignments 5%
Four assignments 20%
Final exam 50%

Letter Grade Distribution:
>= 90.00 A+
85.00 - 89.99 A
80.00 - 84.99 A-
77.00 - 79.99 B+
73.00 - 76.99 B
70.00 - 72.99 B-
67.00 - 69.99 C+
63.00 - 66.99 C
60.00 - 62.99 C-
57.00 - 59.99 D+
53.00 - 56.99 D
50.00 - 52.99 D-
<= 49.99 F

Academic Regulations, Accommodations, Plagiarism University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university’s website [here](#).

Academic Accommodations for Students with Disabilities The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

For Religious Obligations Students requesting academic accommodation on the basis of religious obligation should make a formal, written request to their instructors for alternate dates and/or means of satisfying academic requirements. Such requests should be made during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist, but no later than two weeks before the compulsory event. Accommodation is to be worked out directly and on an individual basis between the student and the instructor(s) involved. Instructors will make accommodations in a way that avoids academic disadvantage to the student. Students or instructors who have questions or want to confirm accommodation eligibility of a religious event
or practice may refer to the Equity Services website for a list of holy days and Carleton’s Academic Accommodation policies, or may contact an Equity Services Advisor in the Equity Services Department for assistance.

**For Pregnancy** Pregnant students requiring academic accommodations are encouraged to contact an Equity Advisor in Equity Services to complete a letter of accommodation. The student must then make an appointment to discuss her needs with the instructor at least two weeks prior to the first academic event in which it is anticipated the accommodation will be required.

**Plagiarism** Plagiarism is the passing off of someone else’s work as your own and is a serious academic offence. For the details of what constitutes plagiarism, the potential penalties and the procedures refer to the section on Instructional Offences in the Undergraduate Calendar.

**What are the Penalties for Plagiarism?** A student found to have plagiarized an assignment may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; and/or a reprimand; a refusal of permission to continue or to register in a specific degree program; academic probation; award of an FNS, Fail, or an ABS.

**What are the Procedures?** All allegations of plagiarism are reported to the faculty of Dean of FASS and Management. Documentation is prepared by instructors and/or departmental chairs. The Dean writes to the student and the University Ombudsperson about the alleged plagiarism. The Dean reviews the allegation. If it is not resolved at this level then it is referred to a tribunal appointed by the Senate.

Plagiarism and cheating at the graduate level are viewed as being particularly serious and the sanctions imposed are accordingly severe. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy (See [here](#)). The Policy is strictly enforced and is binding on all students. Plagiarism and cheating – presenting another’s ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration or completing work for another student – weaken the quality of the graduate degree. Academic dishonesty in any form will not be tolerated. Students who infringe the Policy may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; a refusal of permission to continue or to register in a specific degree program; academic probation; or a grade of Failure in the course.

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