1. Teaching Team

Instructor: Prof. Dimitris Assanis
                  Email: dimitris.assanis@stonybrook.edu - use [MEC 305] in subject line
                  Office Hours: Mon   NOON – 1:00 PM (LE 131)
                            Wed   NOON – 1:00 PM (LE 131)
                            Fri   NOON – 1:00 PM (LE 131) or by apt.

Teaching Assistant: Mr. Stelios Yamalis, stelios.yamalis@stonybrook.edu
                  Office Hours: Tue   1:00 PM – 3:00 PM (TA LOUNGE)
                            Th   1:00 PM – 3:00 PM (TA LOUNGE)

Lectures: M W F 11:00 AM -11:53 AM (FREY 104) – attendance required

Recitation-01:   M 09:00 - 09:53 AM (MELVILLE LBR W4550) – attendance required
Recitation-02:   W 09:00 - 09:53 AM (HVY ENGR LAB 201) – attendance required
                  (No recitations on Week 1)

Zoom Link:
https://stonybrook.zoom.us/j/93609794157?pwd=RWswQWVDcExIZVU3Mzd3UWlrZUgydz09
Meeting ID: 936 0979 4157   Passcode: 305305

2. Course Goal

The goal of the course is to introduce students to the fundamentals of heat and mass transfer as well as unique applications

3. Pre-Requisites

MEC 301 and MEC 364; MEC 102, or ESG 111, or ESE 124, or CSE 114 or 130 or BME 120

4. Course Description

Fundamental laws of momentum, heat, and mass transfer, and the corresponding transport coefficients. Principles of steady-state and transient heat conduction in solids. Laminar and turbulent boundary layer flows, thermal radiation, and radiation heat transfer between surfaces. Applications to heat transfer equipment.

Course Outline: 1. Basic Concepts of Thermodynamics and Heat Transfer (Chapter 1)
              2. Heat Conduction
                    Heat Conduction Equation (Chapter 2)
                    Steady Heat Conduction (Chapter 3)
                    Transient Heat Conduction (Chapter 4)
              3. Convection
                    Fundamentals of Convection (Chapter 6)
                    Forced Convection (Chapters 7 and 8)
                    Natural Convection (Chapter 9)

4. Radiation Heat Transfer (Chapters 12 and 13)

5.   Course Schedule (section & chapter numbers are based on textbook)

Date	Day	Chapter	Topic	HW Assigned	HW Due
22-Jan	Mon	1	Introduction, Syllabus, essential formulations		
24-Jan	Wed	1	Heat transfer mechanisms: conduction,		
26-Jan	Fri	1	Heat transfer mechanisms: convection, radiation	Homework 1: Intro to Heat Transfer	
29-Jan	Mon	2	Heat Conduction Equation - Day 1		
31-Jan	Wed	2	Heat Conduction Equation - Day 2		
2-Feb	Fri	2	Heat Conduction Equation - Day 3	Homework 2: Heat Conduction Eq.	HW #1
5-Feb	Mon	3	Steady Heat Conduction - Day 1		
7-Feb	Wed	3	Steady Heat Conduction - Day 2		
9-Feb	Fri	3	Steady Heat Conduction - Day 3	Homework 3: Steady Heat Conduction	HW #2
12-Feb	Mon	3	Fins - General Fin Equation		
14-Feb	Wed	3	Fins - Fin Boundary Conditions		
16-Feb	Fri	3	Fins - Sample Problems	Homework 4: Fins	HW #3
19-Feb	Mon	4	Transient Heat Conduction - Lumped System Analysis		
21-Feb	Wed	4	Transient Heat Conduction - Different Geometries		
23-Feb	Fri	4	Transient Heat Conduction - Semi-Infinite Solids	Homework 5: Transient Heat Conduction	HW #4
26-Feb	Mon		Conduction Catch-Up Day		
28-Feb	Wed	6	Fundamentals of Convection - Day 1		
1-Mar	Fri	6	Fundamentals of Convection - Day 2	Homework 6: Convection Fundamentals	HW #5
4-Mar	Mon		**Midterm #1 Review**		
6-Mar	Wed	6	Fundamentals of Convection - Day 3		
8-Mar	Fri		**Midterm #1 (SS+Transient Conduction & Fins) - 45 min**		
11-Mar	Mon		**Spring Break (No Class)**		
13-Mar	Wed		**Spring Break (No Class)**		
15-Mar	Fri		**Spring Break (No Class)**		
18-Mar	Mon	7	External Forced Convection - Day 1		HW #6
20-Mar	Wed	7	External Forced Convection - Day 2		
22-Mar	Fri	7	External Forced Convection - Day 3	Homework 7: External Convection	
25-Mar	Mon	8	Internal Forced Convection - Day 1		
27-Mar	Wed	8	Internal Forced Convection - Day 2		
29-Mar	Fri	8	Internal Forced Convection - Day 3	Homework 8: Internal Convection	HW #7
1-Apr	Mon	9	Natural Convection - Day 1		
3-Apr	Wed	9	Natural Convection - Day 2		
5-Apr	Fri	9	Convection Catch-Up Day	Homework 9: Natural Convection	HW #8
8-Apr	Mon	12	Fundaments of Thermal Radiation - Day 1		
10-Apr	Wed	12	Fundaments of Thermal Radiation - Day 2		
12-Apr	Fri	12	Fundaments of Thermal Radiation - Day 3	Homework 10: Radiation Fundamentals	HW #9
15-Apr	Mon	13	Radiation Heat Transfer - Day 1		
17-Apr	Wed	13	Radiation Heat Transfer - Day 2		
19-Apr	Fri	13	Radiation Heat Transfer - Day 3	Homework 11: Radiation Heat Transfer	HW#10
22-Apr	Mon		Radiation Catch-Up Day		
24-Apr	Wed		**Midterm #2 Review**		
26-Apr	Fri		Heat Exchangers - Invitied Guest Lecturer!		HW#11
29-Apr	Mon		**Midterm #2 (Convection & Radiation) - 45 min**		
1-May	Wed		Special Topic		
3-May	Fri		Applications of Heat Transfer in Research		
13-May	Mon		**Final Project Presentations - 11:15AM - 1:45PM - 2h30m**		

6. **Required Course Textbooks and Online Homework System**

The official textbook for this course is:

- Yunus Cengel and Afshin Ghajar, *Heat and Mass Transfer: Fundamentals and Applications*, 6th Ed., McGraw-Hill, 2020.

For this course you will be required to utilize McGraw-Hill Education Connect® access (~$100) for Connect-Semester Online Access or Access Card for Heat and Mass Transfer: Fundamentals & Applications, 6e edition by Cengel and Ghajar. The Connect Access can be purchased as a bundle which includes the eBook for the duration of the access term or a loose-leaf textbook. You are not required to have a printed copy.

Connect Bundles:

Connect + Textbook Rental (online PDF)
ISBN10: 1260858251 | ISBN13: 9781260858259

Connect + Loose Leaf (paper copy)
ISBN10: 1260699323 | ISBN13: 9781260699326

To access the McGaw Hill Connect, sign into D2L Brightspace. Further instructions are provided here for Student Registration:
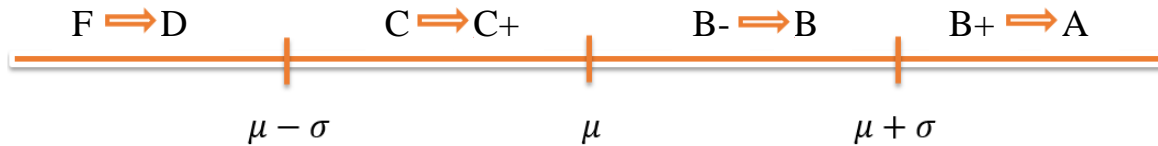https://www.mheducation.com/highered/support/connect/first-day-of-class/d2l.html

Having trouble registering? Get help here: http://bit.ly/StudentRegistration

7. **Grading**

1. Attendance   5%   (Required; randomly checked at recitation/lecture)

2. Homework   10%   (Required; McGraw Hill Connect platform)

3. Midterm I   30%   Friday, March 8th, 2024   (Required; In-Person)

4. Midterm II   30%   Monday, April 29th, 2024   (Required; In-Person

5. Final Project   25%   Monday, May 13th, 2024   (Required; In-Person)

Above distributions are subject to minor adjustment. Question(s) on graded homework/exam will be accepted only for one week after posting of scores.

Your final letter grade maybe be curved (only to improve) and will be decided based on the above weights and your relative placement in the class. The following scale shows roughly what your final letter grade range might look like, where μ is the average, and σ is the standard deviation.

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$$F \Longrightarrow D \qquad C \Longrightarrow C+ \qquad B- \Longrightarrow B \qquad B+ \Longrightarrow A$$

$$\mu - \sigma \qquad\qquad \mu \qquad\qquad \mu + \sigma$$

8. **Homework**

   Homework will be assigned and posted on Brightspace system every week (on Friday) and will be due in one week. You can access Brightspace at: https://it.stonybrook.edu/services/brightspace. Use your NetID and password to log in. Your NetID is different from your Stony Brook ID number.

   Homework must be submitted by the specified due date. No late homework will be accepted as the solutions get posted immediately afterwards.

9. **Course Learning Objectives (CLO)**

   Upon completion of this course, students will be able to:

   1. Demonstrate the ability to identify the three modes of heat transfer: conduction, convection, and radiation, and solve simple multi-mode heat transfer problem.
   2. Demonstrate the ability to formulate and solve the differential equation of heat conduction in various coordinates systems with proper thermal boundary conditions.
   3. Demonstrate the ability to develop thermal resistance networks for practical heat conduction problems.
   4. Demonstrate the ability to solve transient lumped-parameter heat conduction problems.
   5. Demonstrate the ability to analyze convective heat transfer in boundary layer and internal pipe flows based on Newton's law of cooling.
   6. Demonstrate the ability to analyze radiative heat transfer between nonblack surfaces.

10. **Course Delivery/Modality**

    The course delivery will be delivered in-person format and content will be delivered through the D2L Brightspace Digital Learning Environment (DLE). All assignments and course interactions will utilize internet technologies. See "Technical Requirements" section for more information.

11. **Attendance**

    Students are expected to attend every class, report for examinations and submit major graded coursework as scheduled. If a student is unable to attend lecture(s), report for any exams or complete major graded coursework as scheduled due to extenuating circumstances, the student must contact the instructor as soon as possible. **Attendance will be randomly tracked!** Students may be requested to provide documentation to support their absence and/or may be referred to the Student Support Team for assistance. Students will be provided reasonable accommodations for missed exams, assignments or projects due to significant illness, tragedy

or other personal emergencies. In the instance of missed lectures or recitations, the student is responsible for reviewing posted slides recorded lectures and seeking notes from a classmate. Please note, all students must follow Stony Brook, local, state and Centers for Disease Control and Prevention (CDC) guidelines to reduce the risk of transmission of COVID. For questions or more information, visit: https://www.stonybrook.edu/commcms/comingback/students.php

12. **Preferred Method of Contact with Instructor**
My preferred method of contact is via email at **dimitris.assanis@stonybrook.edu**. If you would like to talk on the phone, or meet virtually, please email me so that we can set up a mutually agreeable time. I will respond to your emails as soon as possible, but please allow 24 hours or more for a response. Please utilize your Stony Brook University email when getting in touch with me as that is the preferred method of contact from the institution. Include your full name and NetID in all emails to me. To ensure your email is routed in appropriate folder, **the subject line should contain the following phrase: [MEC 305].**

13. **Technologies and Tools**
An online class like this cannot be conducted without appropriate use of technologies that enable learning outside a traditional classroom and on your own time. Some of the technologies and tools that would be required in this class are:

1. **Computer and Internet Connection**: This course requires that you have a solid wired internet connection to a reliable and working computer with webcam and microphone. Cheap wifi connections do not work and in the past students have had difficulties taking exams when they were connected to unreliable wifi access points, such as at Starbucks, etc. We will not be responsible for you not being able to connect to the servers during assignment deadlines and no extensions on time will be given. Please do not underestimate the importance of having a reliable computer and internet connection. This is the primary reason why students in the past have suffered a great deal. Please install all the updates on your computer well before an exam. The newer versions of Microsoft Windows OS are not very flexible with scheduling updates. You don't want to initiate an update just before a critical assignment or presentation is due.

2. **Brightspace**: The Stony Brook University uses DLE D2L Brightspace for all course-related management. The Brightspace site for this class will be the central online location for posting all class-related materials, announcements, calendar, etc.

3. **McGraw Hill Connect:** The Connect is an online learning platform from McGraw Hill, which you would use for submitting your HW assignments. See the *Required Course Textbooks* section below on details on how to purchase an access.

4. **Calculators**: Only an approved NCEES allowed calculator will be permissible to use during quizzes and exams. Please see the *Calculator Policy* section below on details.

14. **Communication**

You must have an active Stony Brook University e-mail account and access to the Internet. All instructor correspondence will be sent to your SBU e-mail account. Please plan on checking your SBU email account regularly for course related messages. To log in to Stony Brook Google Mail, go to http://www.stonybrook.edu/mycloud and sign in with your NetID and password.

This course uses D2L Brightspace for the facilitation of communications between faculty and students, submission of assignments, and posting of grades. The D2L Brightspace Course Site can be accessed at https://brightspace.stonybrook.edu.

15. **Calculator Policy**

Effective Spring, 2009 only the following calculators are being permitted to be used on all midterm and final exams in the Department of Mechanical Engineering. There will be no exceptions. This list of calculators is identical to that allowed for the National Council for Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) exam that many of you will take in your senior year as well as the Professional Engineering (PE) exam that you may take several years from now. The sooner you become comfortable on one of these calculators, the better.

NCEES Allowed calculators as of Nov 2011:
- Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name.
- Hewlett Packard: The HP 33s and HP 35s models, but no others.
- Texas Instruments: All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.
The NCEES policy on calculators can be found here: http://www.ncees.org/Exams/Exam-day_policies/Calculator_policy.php

16. **Academic Policies**

Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Until/unless the latest COVID guidance is explicitly amended by SBU, during Spring 2022 "disruptive behavior" will include refusal to wear a mask during classes.

University Student Conduct Code can be found at (check for most current version)
http://studentaffairs.stonybrook.edu/ucs/docs/universitystudentconductcode.pdf

ADA & Disability Support Services (DSS) Statement: The Rehabilitation Act of 1973 – Section 504 applies to all postsecondary educational programs that receive federal assistance. Reasonable accommodations and academic assistance are provided to students with disabilities registered with the Disability Support Services, ECC (Educational Communications Center) Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential. For procedures and information go to the following website:
http://www.stonybrook.edu/ehs/fire/disabilities

Course Materials and Copyright Statement: Course material accessed from Bb, SB Connect, SB Capture or a Stony Brook Course website is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity and Student Conduct Codes.

17. **Getting Technical Help**

    DoIT provides technical assistance to all students. If you require assistance with hardware or using any supported applications, available support options include:

    - Visit one of DoIT's Tech Stations
    - Access self-help materials
    - Submit a ticket online at service.stonybrook.edu
    - Chat live with a student consultant
    - Call 631-632-9800 for assistance (2-9800 from on campus)

    If you need assistance with Brightspace, you can access resources from the Brightspace Resources link on Stony Brook Brightspace homepage (https://brightspace.stonybrook.edu) or contact the SUNY helpdesk via phone/ticket/live chat at: https://online.suny.edu/help/

    Need a laptop? You can borrow a laptop from the Melville LIbrary SINC Site. Details can be found at: https://it.stonybrook.edu/services/student-laptop-loaner-program

18. **Subject to Change Notice**

    All material, assignments, and deadlines are subject to change with prior notice. It is your responsibility to stay in touch with your instructor, review the course site regularly, or communicate with other students, to adjust as needed if assignments or due dates change.

19. <u>**Syllabus Disclaimer**</u>

   The instructor views the course syllabus as an educational understanding between the instructor and students. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email or in the course site Announcements. Please remember to check your SBU email and the course site Announcements often.