

Mechanical Engineering Department
Conduction and Radiation Heat Transfer | MEC 502 | 3 Credits

Prerequisite: Graduate Standing
Class Time: Wed: 6:05 - 8:55 PM
Location: MELVILLE LBR N3074

Instructor: Wenhai Li

Email: wenhai.li@stonybrook.edu
Office Hours: Tu: 2:00 – 5:00 PM [via Zoom](#)

Catalog Course Description:

Heat conduction and conservation laws; formulation of conduction equations in differential and integral forms; analytical solution techniques including Laplace transforms and separation of variables; scaling analysis; black body radiation, Kirchoff's law, analysis of heat conduction problems; analysis of radiative exchange between surfaces and radiative transport through absorbing, emitting, and scattering media.

Course Learning Objectives:

- 1 To enhance the understanding of the general principles of conduction and radiation heat transfer.
- 2 To strengthen analytical skills to solve conduction and radiation equations.
- 3 To develop computational skills to solve complex conduction and radiation problems.

Textbooks:

1. Y. Yener and S. Kakac, Heat Conduction, 4th edition (2008), Taylor & Francis, ISBN-9781591690467
2. M.F. Modest Radiative Heat Transfer, 3rd edition (2013), Academic Press, ISBN-9780123869449

Homework:

There will be regularly assigned homework problems, which will be posted on the Blackboard. Students will submit their homework on the Blackboard. Homework needs to be done individually and must be neat and orderly so that your work can be followed clearly.

Exams:

Both the midterm and final exams will be open book. Detailed No makeup exam unless arranged prior to the exam. The exam grades will be posted on Blackboard.

Grading:

Will grade on the curve and the grading scheme is given as follows:

Homework Assignments	20%
Midterm Exam	40%
Final Exam	40%
Total	100%

Tentative Course Outline:

Date	Lectures
Week 1 Aug. 25	Review of Classical Heat Conduction Fundamentals (Yener Ch. 1)
Week 2 Sep. 1	General Heat Conduction Equation (Yener Ch. 2)

Date	Lectures
Week 3 Sep. 08	One-Dimensional Steady-State Heat Conduction (Yener Ch. 3)
Week 4 Sep. 15	Characteristic Values and Functions (Yener Ch. 4)
Week 5 Sep. 22	2-D, 3-D Steady State Heat Conduction, The Method of Separation Variables (Yener Ch. 5)
Week 6 Sep. 29	Unsteady State Heat Conduction (Yener Ch. 6)
Week 7 Oct. 06	The Method of Fourier Transform (Yener Ch. 7)
Week 8 Oct. 13	The Method of Laplace Transform (Yener Ch. 8)
Week 9 Oct. 20	Fundamental of Thermal Radiation (Modest Ch. 1)
Week 10 Oct. 27	Midterm Exam (Conduction)
Week 11 Nov. 03	Radiative Properties (Modest Ch. 3)
Week 12 Nov. 10	View Factors & Ideal Radiation Heat Transfer (Modest Ch. 4)
Week 13 Nov. 17	Radiative Exchange Between Gray, Diffuse Surfaces (Modest Ch. 5)
Week 14 Nov. 24	No Class (Thanksgiving)
Week 15 Dec. 01	Radiative Exchange Between Partially Specular Gray Surface (Modest Ch. 6)
Week 16 Dec. 08	The Radiative Transfer Equation in Participating Media (Modest Ch. 10)
Dec. 13 (Mo) 8:30-11:00pm	Final Exam (Radiation)

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Masks and Social Distancing

For in-person lectures, students are required to wear face masks at all times and maintain social distancing (6 feet between individuals in traditional classrooms, or, in instructional laboratories and similar settings, only a few minutes in closer proximity when absolutely necessary to achieve learning objectives). Students who are feeling ill or experiencing symptoms such as sneezing, coughing, or a higher than normal temperature will be excused from class and should stay at home. Instructors have the right to ask those who are not complying with these requirements to leave class in the interest of everyone's health and safety. If a student refuses to comply with these requirements, the instructor has the right to cancel class.

Student Accessibility Support Center Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center. For procedures and information go to the following website: <https://ehs.stonybrook.edu/programs/fire-safety/emergency-evacuation/evacuation-guide-people-physical-disabilities> and search Fire Safety and Evacuation and Disabilities.

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 is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. 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 University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.