UTTyler ENGINEERING

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MENG 3316 Heat Transfer
Course Syllabus

Semester / Year	Spring / 2023
Catalog Description	Fundamentals and applications of conduction, convection, and radiation heat transfer. Analysis of steady-state and transient conduction employing analytical methods and numerical techniques. Simple theory of laminar and turbulent, free and forced convection and use of practical correlations. Basic thermal radiation concepts and applications. Three hours of lecture per week.
Prerequisites	MENG 3310 Fluid Mechanics MENG 3401 Thermodynamics
Section Number	001
Instructor Name	Professor Matthew Lucci
Contact Information	mlucci@uttyler.edu
Class Type / Instruction Mode / Location	Face-to-Face, RBN 3038
Class Time	9:30 AM - 10:50 AM, Tuesdays and Thursdays
Office Hours	12:30 PM - 2 PM on Tuesdays and Thursdays, or by appointment. RBN 3004 in person or virtual.
No. of Credits	3
Required Textbook	Fundamentals of Heat and Mass Transfer, 8th edition, by Bergman, Lavine, Incropera, DeWitt, Wiley, 2018.
Optional References	
Additional Rules and Requirements	Attendance is highly encouraged.
Evaluation Method	Project: 40% Homework: 10% Quizzes: 10% Exam 1: 20% Exam 2: 20%
Grading Policy / Scale	Letter grades, scale: A: 90 – 100; B: 80 – 89; C: 70 – 79; D: 60 – 69; F: < 60
Important Events / Dates	Census date: January 23, 2023 Exam date: TBD Last date to withdraw from one or more 15-week courses: March 23, 2023 Final date: TBD
Attendance / Makeup policy / other rules	There will be no make-up exams or quizzes. Students may receive up to three (3) excused absences by notifying the professor ahead of time for medical/personal reasons.
Course Learning Objectives / ABET & PEOs Relation	By the end of this course, students will be able to: 1. apply the conservation of energy to basic heat transfer analysis.

	2. apply the heat conduction equation in one-dimensional and limited multi-dimensional situations. 3. use a computer numerical solution for the numerical analysis of heat transfer. 4. apply engineering analysis to unsteady heat conduction. 5. apply convective heat transfer correlations to external and internal flows. 6. apply radiative heat transfer analysis techniques to engineering situations
Tentative Topics / Course Plans	CHAPTER 1: (sections 1.1 - 1.4, 1.6). Introduction of heat transfer, conduction, convection, and radiation, a thermal property of matter. CHAPTER 2: (sections 2.1-2.4). Introduction to conduction: ▪ The conduction rate equation. ▪ The heat diffusion equation. ▪ The boundary and initial condition. CHAPTER 3: (sections 3.1(3.1.1, 3.1.2, 3.1.3), 3.3, 3.5,3.6). One-dimensional, Steady-State Conduction. ▪ Temperature distribution, Thermal resistance. ▪ Radial System. ▪ Conduction with thermal Energy Generation. ▪ Heat transfer from the extended surface. CHAPTER 4: (Sections 4.1-4.5). Two-dimensional, Steady-state Conduction. ▪ The method of separation of variables. ▪ The conduction shape factor ▪ Finite-Difference equation. CHAPTER 5: Transient Conduction. ▪ Constant temperature boundary condition. ▪ Constant heat flux boundary condition. CHAPTER 6: Introduction to Convection. (Sections 6.1-6.7). ▪ The convection boundary layers. ▪ Local and average convection coefficient. ▪ The boundary layer equations. ▪ Laminar and turbulent flow. CHAPTER 7: External flow convection. (sections 7.1-7.8). ▪ The flat plate in parallel flow. ▪ Methodology for a conservation calculation. ▪ The cylinder in crossflow.

	▪ The sphere. ▪ The flow over bank of tubes CHAPTER 8: Internal flow convection. . ▪ Hydrodynamics consideration. ▪ Thermal consideration. ▪ The energy balances. ▪ Laminar flow in circular tubes ▪ Convection correlations. CHAPTER 9: Free Convection. ▪ The governing equation for laminar boundary layers. ▪ Laminar free convection on a vertical surface. ▪ The effect of turbulence. ▪ Empirical correlation CHAPTER 11: Heat Exchangers. (sections 11.1-11.5). ▪ Heat exchanger types, coefficient, and analysis. ➢ Log mean. ➢ The effectiveness-NTU. CHAPTER 12: Radiation heat transfer. (sections 12.1-12.8). ▪ Radiation heat flux and radiation intensity. ▪ Blackbody radiation. ▪ Emission from the real surface. ▪ Kirchhoff's law.
University Policies	https://www.uttyler.edu/academic-affairs/files/syllabus_information_2021.pdf