UTTyler ENGINEERING

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MENG 5343 – Advanced Heat Transfer
Course Syllabus

Semester / Year	Spring 2026
Catalog Description	Multidimensional steady and transient heat conduction; forced and natural convection; radiation exchange
Prerequisites	MENG 3316 (Heat Transfer)
Section Number	030 and 050
Instructor Name	Hayder Abdul-Razzak
Contact Information	832.439.7080; habdulrazzak@uttyler.edu
Class Type / Instruction Mode / Location	030: Face-to-face / Lectures / HEC A216 050: Hybrid / Lectures / RBN 3040
Class Time	W: 5:00 p.m. – 7:45 p.m.
Office Hours	W: 3:30 pm – 5:00 pm, Th: 12:30 pm – 2:00 pm, or by appointment
No. of Credits	3
Required Textbook	Heat Transfer, 1st edition, by Nellis and Klein, Cambridge University Press, 2009 (ISBN 978-1-107-67137-9)
Optional References	FE Supplied Reference Handbook, NCEES (National Council of Examiners for Engineering and Surveying)
Additional Rules and Requirements	1. Since the mechanical engineering program is designed to prepare students for professional practice, all submitted work (e.g., homework, lab reports, projects, presentations) is expected to meet professional standards. Work that does not reflect professional quality may be subject to grade reductions, even if professionalism is not explicitly listed in the grading rubric. 2. Students can use AI programs (ChatGPT, Copilot, etc.) in this course. If you utilize an AI tool to help create content for an assignment, you must acknowledge and cite the tool's contribution to your work.
Evaluation Method	Exercises 20%/ Paper (Project) 20%/ 2 Midterm Exams 40%/ Final Exam 20%
Grading Policy / Scale	A = > 90, B = > 80, C = > 70, D = > 60, F < 60
Important Events / Dates	Census date: January 26 Last Day to Withdraw date: March 30 Final Exam date: TBA
Attendance / Makeup policy / other rules	**ATTENDANCE.** Regular attendance is required. In case you have to miss a class, it is your responsibility to keep up with the class work and be informed of all announcements made in the class. **THERE WILL BE NO MAKE-UP EXAMS.** The percentage of any exam missed by a student will be added to his/her final comprehensive exam only if prior approval is granted. The student is responsible to contact the instructor at least a week before the scheduled exam date to get an excuse from the exam. If you have to miss an exam due to emergencies (such as medical and other emergencies) please inform the instructor as soon as possible before or

	immediately after the exam. Class average for each exam will be announced in class and also posted in Canvas after each exam. Final course grades will be determined on the basis of the class average. If you miss any exam without getting **prior approval from the instructor at least a week before the exam date**, it will be counted as zero in the calculation of your final course grade. If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least a week prior to the date of the planned absence.
Course Learning Objectives / ABET & PEOs Relation	By the end of this course, students will be able to: 1. Derive analytical solutions to heat transfer problems 2. Use analytical solutions to determine temperature distribution 3. Analyze systems using the principles of conduction, convection, and radiation 4. Analyze multimode heat transfer problems to determine heat transfer rates as well as temperature distribution 5. Apply numerical methods to solve heat transfer problems 6. Enhance literature research and oral presentation skills transfer
Tentative Topics / Course Plans	Week 1: Introduction, conduction heat transfer 1-D conduction with generation Resistance concepts, circuits and approximations Week 2: 1-D conduction, numerical solution Extended surfaces, fin efficiency and resistance Extended surfaces-fin behavior Week 3: Bessel functions Introduction to separation of variables Separation of variables and superposition Week 4: Lumped capacitance problems-analytical solutions and the lumped time capacitance time constant Numerical solutions to lumped capacitance problems Week 5 Transient 1-D problems – semi-infinite bodies and the diffusive time constant Laplace transforms for 1-D transient problems Separation of variables for transient problems Numerical solutions to 1-D transient problems Week 6: **Review and Exam #1**

	Week 7: Boundary layer concepts Boundary layer equations Dimensional analysis and correlation Week 8: Turbulent concepts Reynolds average equations, inner Coordinates Integral method- momentum and energy equations Week 9: SPRING BREAK Week 10: Internal flow concepts Internal flow correlations Internal flow energy balance Natural Convection Week 11: **Review and Exam #2** Week12: Introduction to radiation, blackbodies Blackbody radiation exchange Week 13: Real surfaces Diffuse gray surface radiation exchange Week 14: Introduction to heat exchangers The LMTD Method Effectiveness-NTU method Week 15: Paper Review/Project Week 16: **Final Exam**
University Policies	https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information-rev122025.pdf