DEPARTMENT: MECHANICAL ENGINEERING

COURSE #: EML 5152, 3 credits

COURSE TITLE: Fundamentals of Heat Transfer

TYPE COURSE: Core
Track: Thermal Fluids

TERMS OFFERED: Fall

CATALOG DESCRIPTION:
This course is intended to develop an in-depth understanding of the mechanisms and methods of conduction and radiation heat transfer. This will include learning about the fundamental aspects of heat conduction and radiation and methods of applying the theory in practical problems.

PREREQUISITES:

Thermal Fluids I and II (EML 3015 & 3016);

Analysis in Mechanical Engineering (EML5060);

or equivalent graduate standing

AREA COORDINATOR: Dr.
RESPONSIBLE FACULTY: Dr. Wei Guo

INSTRUCTOR OF RECORD: Dr. Wei Guo
Magnet Lab, A244
(850) 644-3980
wguo@magnet.fsu.edu
Office Hours: To be announced

CLASS SCHEDULE:

Class: Twice weekly for 1 hr. and 15 min.
Lab: None

TEXTBOOKS/REQUIRED MATERIAL:

1. *Heat Conduction, 4th Ed., Taylor & Francis, 1993, by S. Kalac and Y. Yener.*
2. *Radiation Heat Transfer, Oxford University Press Inc, 2000, by H.R.N. Jones.*

References, Additional Resources:

1. *Incropera and DeWitt, Fundamentals of Heat Transfer*

SCIENCE/DESIGN (%): the class is lecture format

COURSE TOPICS:
The topics to be covered includes (not necessarily in the order shown)

1. Review of Heat Transfer Fundamentals
   - Conduction heat transfer
   - Convection heat transfer
   - Radiation heat transfer
2. Steady conduction heat transfer
   - Fourier's Law
   - 1D conduction
   - 2D and 3D conduction
   - Numerical methods
3. Time dependent conduction heat transfer
   - Diffusion equation
   - 1D analytic solutions
   - 2D and 3D numerical methods
   - Numerical methods
4. Radiation heat transfer
   - Stefan-Boltzmann law
   - Emissivity & view factors
   - Multilayer shielding

ASSESSMENT TOOLS:

1. Homework problems (25%)
2. Attendance and performance (5%)
3. Two exams (40%)
4. Final (30%)

5. Combing conduction and radiation heat transfer	

Course Objectives for FSU Curriculum File Syllabus	At the end of the course the students are expected to 1. Overall Goal: To develop an in-depth understanding of conduction and radiation heat transfer 2. To learn about heat transfer modes in inhomogeneous media 3. To become familiar with numerical methods of solving conduction heat transfer problems in multi-dimensional systems 4. To become familiar with analytical methods of solving conduction heat transfer 5. To learn how to solve time dependent conduction heat transfer problems 6. To learn how to analyze heat transfer by radiation in a variety of geometries and configurations 7. To learn to solve combined conduction and radiation heat transfer problems
Justification for addition or change	N/A

Level of computer usage:	None	Elementary	Intermediate ☑	Advanced	
Modes of Instruction:	Lecture ☑	Lab ☐	DIS	Discussion ☑	Other
Core Curriculum Course:	Yes ☑	No			
Availability to other Majors:	Yes	No ☑			

COURSE OBJECTIVES*	a. To develop an in-depth understanding of conduction and radiation heat transfer b. To learn about heat transfer modes in inhomogeneous media c. To become familiar with numerical methods of solving conduction heat transfer problems in multi-dimensional systems d. To become familiar with analytical methods of solving conduction heat transfer e. To learn how to solve time dependent conduction heat transfer problems f. To learn how to analyze heat transfer by radiation in a variety of geometries and configurations g. To learn to solve combined conduction and radiation heat transfer problems
COURSE OUTCOMES*	Numbers shown in brackets refer to department Student **Program Outcomes** – 1. An ability to apply knowledge of mathematics, calculus based science and engineering to mechanical engineering problems 2. An ability to design thermal systems, components, or processes to meet desired needs 3. An ability to identify, formulate, and solve heat transfer problems 4. An ability to communicate effectively with written, oral, and visual means 5. A recognition of the need for, and the ability to engage in life-long learning 6. An ability to use modern engineering techniques, skills, and computing tools necessary for engineering practice