COURSE NUMBER: ME 3333, 3 credits	**COURSE TITLE:** Thermal Sciences III
TERMS OFFERED: Fall, Spring, Summer	**PREREQUISITES:** ME 3332, [ME 4031W], ME upper division
TEXTBOOKS/REQUIRED MATERIAL: *Heat Transfer, J.P. Holman*, 9th Edition, McGraw Hill, New York, 2002 *Fundamentals of Heat Transfer*, F.P. Incropera & D.P. DeWitt, 5th Edition, John Wiley & Sons, New York, 2002. (representative)	**COGNIZANT FACULTY:** THT Staff **DATE OF PREPARATION:** *10 April 2007*
COURSE LEADER(S): THT Staff	**CLASS/LABORATORY SCHEDULE:** Three 50-minute lectures / week One 50-minute recitation / week **CONTRIBUTION OF COURSE TO MEETING PROFESSION OBJECTIVES:** 100% Engineering Topics
CATALOG DESCRIPTION: Mechanisms of heat transfer: conduction, convection, radiation. Differential analysis of momentum/energy equations. Forced/natural convection, heat exchangers.	**COURSE TOPICS:** 1. Foundations of heat transfer 2. Conduction heat transfer 3. External convective heat transfer 4. Dimensional analysis 5. Internal viscous flow and heat transfer 6. Heat exchangers 7. Thermal radiation

COURSE OBJECTIVES	1. Understand the scope and limits of the laws of heat transfer. 2. Develop an orderly systematic approach to problem solving. 3. Use the principles of heat transfer in engineering design and product development. 4. Develop an ability to analyze heat transfer processes and equipment (specifically, heat exchangers). 5. Understand the use of open systems, closed systems, and control surfaces in both heat transfer and fluid mechanics. 6. Understand the nature of shell balances for mass, momentum and energy in the formation of mathematical description of problems in heat transfer and fluid mechanics. 7. Exercise the principles of heat transfer and fluid mechanics in pre-defined problem and in open ended (design) problems. 8. Practice using the principles of heat transfer and fluid mechanics via problems that illustrate the fundamental concepts. 9. Master these key concepts: Fourier's law of heat conduction; Newton's cooling law for convective heat transfer; Stephan-Boltzman radiation law; correlations for convective heat transfer; heat exchanger effectiveness; form drag and skin friction; description of laminar and turbulent flow; the boundary layer; the state of stress in a fluid; the relationship between pressure drop and convective heat transfer.
COURSE OUTCOMES	**(Letters shown in brackets are linked to program outcomes a-k)** 1. Demonstrate a fundamental understanding of the heat transfer modes of conduction, convection and radiation. [a, e] 2. Successfully compute convective heat transfer coefficients for a variety of engineering problems including: forced convection; natural convection; internal flows; external flows; laminar and turbulent flows. [a, c, e] 3. Understand the fundamentals of heat conduction, which may include: steady and transient heat conduction, one-dimensional conduction and conduction in multi-dimensions [a, c, e] 4. Demonstrate engineering design fundamentals for heat exchangers, which may include the epsilon-NTU and LMTD methods. [a, c, e, k] 5. Demonstrate a fundamental understanding of radiation heat transfer; successfully compute radiation heat transfer rates. [a, c, e] 6. Introduce numerical solutions in one or more of the following areas: conduction, convection, and radiation [a, c, e, k]
ASSESSMENT TOOLS	1. Mid-term examinations (2-4) and a comprehensive final exam (2 hour) 2. In class problems and discussion 3. Weekly homework problems and quizzes

ME 3333

Nature of Changes:

• Class will always meet a minimum of 4 times per week (during day school)

• Course Outcomes 3, 4 & 6 were rewritten based on the Outcome Assessment Process. See review of 3333.