1. Department, Course Number, and Course Title:

MECHANICAL ENGINEERING

ME 406 HEAT TRANSFER II

2. Designation:

Required	☐	Elective	☑
Lower Division	☐	Upper Division	☑

3. Course Description: Numerical methods in conduction; theory and application of convection; thermal radiation; condensing and boiling hear transfer; mass transfer special topics.

4. Prerequisites: ME 306 (Heat Transfer I) and CS 290 (Introduction to FORTRAN programming)

5. Text and Materials: Heat Transfer, Eight Edition, J. P. Holman, McGraw-Hill, 1997

6. Course Objectives: The student will gain an in-depth understanding of the principle modes of heat transfer. Additionally, the student will demonstrate the use of methods for performing heat transfer analysis.

Course Outcomes

- an understanding of the finite difference methods of steady-state numerical conduction and convection analysis
- an understanding of the finite difference methods of transient numerical conduction and convection analysis
- an understanding of boundary layer analysis
- the ability to determine the convection heat transfer coefficient in laminar flow
- the ability to determine the convection heat transfer coefficient in turbulent flow
- an understanding of the principles of free convection
- the ability to determine the convection heat transfer coefficient of free convection heat transfer
- an understanding of the effects of turbulent flow on heat transfer
- an understanding of radiation heat transfer
- the ability to determine the radiation heat transfer to and from black and gray bodies
- an understanding of the principles of boiling and condensing
- an understanding of the principles of mass transfer

7. Topics Covered: (in Order of Presentation)

- Numerical methods in conduction
- Design analysis of conduction in simple components
- Basic boundary layer theory convection
- Introduction to turbulence and eddy diffusivity models
- Design and analysis of convect ion heat transfer equipment
- Theory of black and diffuse gray thermal radiation
- Introduction to boiling and condensing
- Introduction to mass transfer

8. Class Schedule:

Number of Sessions per week:	2
Duration of each session:	1 hour 40 minutes

9. Contribution of course to meeting the professional component:

This course is part of the 24 units of technical electives required for the mechanical engineering program.

Engineering Science	2 units
Engineering Design	2 units

10. Relationship of course to program objectives:

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs (abet c)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process that lends itself to identifying, formulating, and solving engineering problems (abet e)

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- an understanding of responsibility and accountability
- a desire to be a professional that exhibits values, dedication and a need for continual improvement
- a desire to be a flexible and adaptable team player (collaborative attitude)

11. Prepared by: Darrell Guillaume 01/2006