AME 331 (SECTION 28762): Heat Transfer (3 units)

Course Syllabus (Rev. 0)

Spring 2013

INSTRUCTOR INFORMATION:

Instructors:
Dr. Manny Dekermenjian dekermen@usc.edu
Urgent only: manny_duke@yahoo.com
Dr. Rick Martin richarjm@usc.edu
Urgent only: rmartin@martinthermal.com
Office Loc: BHE-315

Lecture:
GFS-118 T, Th 12:30 – 13:50 pm

Office Hours:
MD: Tu 10:00-11:00, Tu 14:30-16:30
RM: Th 9:00-10:30, Th 14:30-16:00

Teaching Assistant:
tbd
Office Loc:

Discussion Sections:
W: tbd

Office Hours:
M,Tu,W,F: tbd

TEXT, READING RESOURCES

Required course text: *Heat and Mass Transfer – Fundamentals and Applications Fourth Edition;* Yunus A. Cengel and Afshin J. Ghajar; McGraw-Hill, 2011. Chapters 1–9 and 11–13.

Required supplementary text: *Schaum's Outline of Heat Transfer, 2nd Edition*; Donald Pitts, McGraw-Hill, 1998.

ISBN# for package of two texts is 9780077837785.

PURPOSE OF COURSE

Catalog Description: General principles underlying heat transfer by conduction, convection, and radiation; steady and transient conditions. Prerequisite: AME 310; Corequisite: AME 309 or CE 309.

General. This course is a one-semester introduction to heat transfer for mechanical and aerospace engineering students and others who need a solid understanding of the subject. For students intending to specialize in the thermosciences, advanced courses in convection, radiation, mass transfer, boiling/condensation, combustion, heat exchangers, and computational methods are encouraged.

Background. The course material presented assumes the student has attained competency in physics, chemistry, calculus (including some knowledge of differential equations), engineering thermodynamics, and fluid mechanics. The format will be lecture plus optional discussion sections. There is no lab.

Applications. To emphasize the practical aspects of the subject, the lectures will contain "real world" applications of heat transfer in the engineering profession. Practical application topics may include: industrial freezers, computer chip cooling, coffee makers, utility boilers, thermal oxidizers, rotary kilns, temperature sensors, space shuttle tiles, and burn injuries.

Instructors. Drs. Martin and Dekermenjian will lecture and provide office hours as a “team”. To minimize space conflicts, students are encouraged to limit their attendance to the section for which they are enrolled. Students enrolled in Section 28761 will have their work evaluated by Dr. Martin. Students enrolled in section 28762 will have their work evaluated by Dr. Dekermenjian.

Objective: To introduce the student to the fundamentals of heat transfer by conduction, convection (forced and buoyant) and radiation.

After completing this course, students will be able to:

1. Scrutinize a heat transfer calculation for “obvious” mistakes
2. Analyze 1-D steady heat conduction in planar, cylindrical and spherical geometry
3. Use conduction shape factors and know when shape factors are not applicable
4. Employ a spreadsheet program for approximating solutions of 2-D conduction problems
5. Know what the lumped capacitance method for unsteady conduction is, and when it is applicable
6. Describe the structure of thermal and momentum boundary layers
7. Know the difference between constant-temperature and constant-heat-flux convection problems
8. Apply empirical formulas for forced or buoyant convection to compute temperature or heat flow
9. Understand and employ dimensionless parameters to characterize thermal systems.
10. Compute radiation heat transfer between two or more gray surfaces with known shape factors
11. Estimate which mode of heat transfer (conduction, convection, radiation) dominates a system
12. Perform a preliminary design of a heat exchanger.

Students earn points by successfully completing the following assignments:

- Homework 240 (approximately 1 per week, graded)
- Quizzes 100 (4 per semester)
- Midterm Exams 300 (2 per semester)
- Design Project 60 (1)
- Final Exam 300 (1)
- Extra Credit ~40 (2 assignments, 1 due at each midterm)

Final grades are based on absolute scores and calibrated against a normal distribution to ensure fairest treatment for each student. See course schedule for reading and homework assignments.

A (920+), A- (880+)	(mastered essentially all the material)
B+ (850+), B (820+), B- (780+)	(mastered the majority of the material)
C+ (750+), C (720+), C- (680+)	(understood the material)
D+ (650+), D (600+)	(grasped the minimum amount of material)
F (599 and below)	(failed to grasp the material; must re-take course)

Heat Transfer is a difficult but rewarding subject.
Don’t fall behind by failing to complete homework (24% of grade)!