

MAE 101C
Heat Transfer (4 units)

Class/Laboratory Schedule: four lecture hours per week, eight hours outside preparation. 12 hours/week total.

Course Coordinator(s): Kal Seshadri

Textbooks/Materials: Kreith, F., and Bohn, M.S, Principles of Heat Transfer, PWS Publishing Company or Introduction to Heat Transfer 5th ed, Incropera, DeWitt, Bergman et al., Wiley.

Catalog Description: Extension of fluid mechanics in MAE 101A-B to viscous, heat-conducting flows. Application of the energy conservation equation to heat transfer in ducts and external boundary layers. Introduction to heat conduction and radiation transfer. Calculation of heat-transfer coefficients in forced and free convection. Design applications including heat exchangers.

Prerequisites: Admission to the engineering major and MAE 101A-B, and MAE 105 with grades of C- or better.

- Required Course
- Technical Elective Course
- Other: _____

Performance Criteria:

Objective 1

- 1.1 Students will demonstrate an understanding of conductive, convective and radiative heat transfer
- 1.2 Students will be able to recognize applications in which heat transfer is involved

Objective 2

- 2.1 Students will demonstrate the ability to analyze steady heat conduction
- 2.2 Students will demonstrate the ability to analyze transient heat conduction
- 2.3 Students will demonstrate the ability to calculate heat transfer by forced convection
- 2.4 Students will demonstrate the ability to calculate heat transfer by natural convection
- 2.5 Students will demonstrate the ability to calculate heat transfer by radiation

Objective 3

- 3.1 Students will demonstrate the ability to analyze heat exchangers
- 3.2 Students will be able to design heat exchangers for different applications

Course Objectives:

(Numbers in parenthesis refer to MAE Program Outcomes)

Objective 1: To teach students the basic principles underlying heat transfer (1a, ME15).

Objective 2: To train students to identify, formulate and solve engineering problems in heat transfer (1a, 5e, ME15, AE12, AE13).

Objective 3: To introduce students to design concepts involving heat transfer (1a, 3c, ME15)

Course Topics:

1. Introduction to concepts of heat transfer
2. Electrical analogies for conduction, convection and radiation
3. Steady heat conduction
4. Transient heat conduction
5. Fundamentals of convection
6. Natural convection
7. Internal forced convection
8. External forced convection
9. Heat exchangers
10. Radiation
11. Phase change in heat transfer

Prepared By: K. Vecchio, March 2000

Revised: Prab bandaru & Joanna McKittrick, April 2008, via Teaching Work Group Meeting

Reviewed and Revised: TWG, June 2010; June 2011

Reviewed: August 2012