1. **MEEG 342** **HEAT TRANSFER**

2. **Credits 3** **Contact Hours 3**

3. **Spring 2017** Dr. Merve Erdal, Ph.D.; Office: 105 Spencer Hall

4. **Textbook** "Fundamentals of Heat and Mass Transfer", 7th edition, T.L. Bergman, A.S. Lavine, F. P. Incropera, D.P. DeWitt, John Wiley & Sons, 2011, ISBN: 13 978-0470-50197-9

5. **Specific course information**

   a. **Catalog Description:** Conduction, convection and radiation heat transfer. Finite-difference methods for solving transient, multi-dimensional problems numerically. Analysis of fins and heat exchangers.

   b. **Prerequisite:** MEEG 341 and MATH 352, Co-requisite: MATH 353

   c. **Course is required.**

6. **Specific goals for the course**

   a. **Specific Outcomes of Instruction:** This course introduces students to modes of heat transfer (conduction, convection and radiation) and the application of conservation of energy principles in heat transfer problems. In conduction, the students are expected to understand and calculate the rate of heat transfer and temperature distributions under steady state and transient conditions. Students will also demonstrate the use of finite difference methods to solve multi-dimensional heat transfer problems. In convection, the students are expected to calculate heat transfer rates for natural convection and forced convection under laminar and turbulent flow conditions for internal and external flows using established correlations. In radiation, the students are expected to calculate radiative heat transfer for black and gray surfaces. By the end of the semester, the student should be able to identify the relevant mechanism of heat transfer for a given situation, reduce the problem to a manageable level by making suitable approximations, and obtain useful engineering solutions. They are also expected to apply these analysis tools to Fins and Heat Exchangers.

   b. **Student Outcomes Addressed:**
   Assigned student outcome(s) for MEEG 342 in 2016-2017 academic year:
   Outcome j: a knowledge of contemporary issues

## 7. Brief list of topics to be covered

- Conduction Heat Transfer
  - The Conduction Rate Equation, The Thermal Properties of Matter, The Heat Diffusion Equation, Boundary and Initial Conditions,
  - 1-D Steady State Heat Conduction, Thermal Contact Resistance, Conduction with Thermal Energy Generation, Heat Transfer from Finned Surfaces
  - Transient Conduction, Lumped-Capacitance Method
  - Finite Difference Methods Heat Conduction Problems
- Convective Heat Transfer
  - External/internal flow, Laminar vs. Turbulent Flow
  - Forced Convection for Internal/External Flow
  - Relations for Convective Heat Transfer Coefficient
  - Application to Heat Exchangers
- Radiative Heat Transfer
  - Blackbody Radiation, Radiative Properties of Surfaces, The View factor
  - Radiative Exchange between Surfaces