1. **Course number and name**
   MEEG 342, Heat Transfer

2. **Credits and contact hours**
   3 credits, 3 contact hours

3. **Instructor’s or course coordinator’s name**
   Lian-Ping Wang, Mechanical Engineering

4. **Required Textbook**

5. **Specific course information**
   **Catalog Data**

   **Prerequisites**
   MEEG341 (Thermodynamics) and MATH352 (Engineering Mathematics II) and MATH353 (Engineering Mathematics III)

6. **Specific goals for the course**
   **Specific outcomes of instruction**
   This course introduces students to mechanism and modes of heat transfer and conservation of energy principles. It covers understanding of heat transfer by conduction, convection and radiation. In conduction, the students are expected to understand and calculate the rate of heat transfer 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, they are expected to understand why the heat transfer coefficient changes with the fluid and flow properties and should be able 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, they are expected to understand the radiative law, different factors that influence radiation and calculation of 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.

   **Student outcomes**
   The computer project and homework problems presented to students in this course teach them the physical realization, formulation, analysis, and solution of “real-world” problems. Assigned outcomes for 2013-2014:
   - Outcomes c. an ability to design a system, component, or process to meet desired needs.
   - Outcome j: a knowledge of contemporary issues.

7. **Topics**
Introduction to Conduction: including The Conduction Rate Equation, The Thermal Properties of Matter, The Heat Diffusion Equation, Boundary and Initial Conditions

One Dimensional Steady State Heat Conduction: including The Plane Wall, Cylinder, Sphere and Composite Medium; Thermal Contact Resistance; Critical Thickness of Insulation; Conduction with Thermal Energy Generation; Heat Transfer from Finned Surfaces; Fin Performance, Efficiency and Design

Transient Conduction including Lumped-Capacitance Method; and Semi-Infinite Solid; Analytic Solutions


Analysis of Convective Heat Transfer: including Flow over a Body; Flow inside a Duct; Effects of Turbulence;; The convection coefficients

Forced Convection for Flow inside Duct: including Hydrodynamic and Thermal Considerations, Laminar flow in Circular tubes: Thermal Analysis, Convection co-relations


Radiation: including Thermal and Blackbody Radiation, Radiative Properties of Surfaces,The View factor

Radiative Exchange between Black and Gray Surfaces

Radiative Exchange with Participating Media