1. ME 5341, Case Studies in Thermal Engineering and Design

2. 4 credits, 4 contact hours.

3. Instructors: E. Sparrow

4. Textbooks: Not applicable

5. Specific course information:
   a. Catalog description: Modeling and numerical simulation tools and their application to industrial, multidisciplinary problems involving fluid and solid mechanics; conduction, convection, and radiation heat transfer; and thermal stresses.
   b. Prerequisites: ME 3331, ME 3332, ME 3333
   c. Elective course for ME students.

6. Course outcomes (related ABET student outcomes indicated in square brackets):
   a. An ability to frame open-ended problems to identify the missing information and determine reasonable solution techniques among several candidate methods. [1,2,4]
   b. An ability to translate physical models into mathematical models. [1,2]
   c. An ability to exploit numerical-simulation tools to solve multidisciplinary problems. [1]
   d. An ability to search the literature to find the necessary information to complete the design or analysis of a complex system. [1,4,7]
   e. An understanding of the simplifications in the models taught to them in earlier courses which did not make use of numerical simulation. [1]
   f. An ability to prepare a professional report, including a problem statement, a statement of the objectives, a well-documented solution procedure and a discussion of the results. [3]

7. Course topics:
   a. Advanced computational tools for heat conduction, fluid flow, convective heat transfer, structures, and thermal stresses.
   b. Fundamental physical processes in heat transfer and fluid mechanics conveyed via displays of results from numerical solutions.
   c. Assessment of validity of standard simplifying assumptions used in academic models of heat transfer and fluid flow problems.
   d. Methodology for modeling of complex physical and industrial problems and numerical implementation of the models.