1. ME 4331, Thermal Energy Engineering Laboratory

2. 4 credits, 5 contact hours.

3. Instructors: J. Hong, A. Hubel, V. Srinivasan

4. Textbook: Not Applicable
   a. Materials posted on course website

5. Specific course information:
   b. Prerequisites: ME 4031W, ME 3331, ME 3332, ME 3333.
   c. Elective for ME students.

6. Course outcomes (related ABET student outcomes indicated in square brackets):
   a. An ability to study problems in heat transfer using experimental techniques. [1,6]
   b. An ability to work on experimental teams. [5]
   c. An ability to plan experiments, design problem solving strategies, assess, and, if necessary, modify those strategies to achieve the given goals. [1,2, 4,6]
   d. An ability to analyze data and to perform uncertainty analysis. [1,6]
   e. An ability to present experimental results in various forms of presentation: written formal and informal reports, oral presentations, and poster presentations. [3,6]
   f. An ability to distinguish between individual achievements and group achievements in their presentations. [3,4]
   g. An ability to utilize state-of-the-art instrumentation, such as lasers and optical interferometers. [7]
   h. An ability to identify factors related to efficiency of engineering systems and devices. [1,4]
   i. An ability to design a new experiment. [1,2,6,7]

7. Course topics:
   a. Temperature Measurement, thermocouples, RTD’s, optical methods.
   b. Data Acquisition, introduction to C programming, AD-conversion, digitization error.
   c. Data and Uncertainty Analysis, mean value, standard deviation, confidence interval, propagation of uncertainty.
   d. Statistical Design of experiments, 2^n factorial design, significant effects.
   e. Laboratory Safety.
   g. Boiling Heat Transfer, boiling curve, critical heat flux.
   h. Fin heat transfer, fin arrays, forced and free convection, adiabatic tip approximation, effective length of fins, fin efficiency.
i. Optical Interferometer and natural convection. Interference, introduction to optical techniques, natural convection fundamentals.

j. Gas turbine analysis, Brayton cycle, isentropic efficiencies, engine thrust and thrust efficiency, high speed flow measurement.

k. Differential scanning calorimeters.