1. **MEEG346 THERMAL LAB**
2. **Credits 1 Contact Hours 9 per week**
3. **Spring 2017** S. Dyer Harris, Ph.D.; Spencer Lab
4. **Textbook** none
5. **Specific course information**
   a. **Catalog Description:** Introduction to experimental and measurement techniques related to both thermodynamics and heat transfer. Designed to complement MEEG341 and MEEG342.
   b. **Prerequisite:** MEEG341, Thermodynamics, and MATH352, Engineering Math II Co-requisite: MEEG342, Heat Transfer
   c. **Course is required.**
6. **Specific goals for the course**
   a. **Specific Outcomes of Instruction:** This is a 1-cr lab designed to complement prerequisite MEEG341 (Thermodynamics) and co-requisite MEEG342 (Heat Transfer). Students working in teams of 3-6 perform a series of experiments pertaining to the ideal vapor compression refrigeration cycle, free convection heat transfer from a heated fin and tube, forced convection and radiation from a heated surface, two-dimensional heat conduction, and parallel and counter-flow heat exchangers. Two experiments are observation and data analysis of large scale operating chillers and boilers in the campus powerhouse.

   By the end of the semester, students should be able to:

   - Demonstrate familiarity with computerized data acquisition, the use of pressure-transducers, thermocouples, and flow meters.
   - Apply these tools to experimentally investigate phenomena of importance to heat transfer and thermodynamics, including both laboratory scale and industrial scale equipment.
   - Apply principles of physics, chemistry and mathematics to analyze and interpret experimental data.
   - Work effectively in teams in data recording and report compilation.
   - Produce professionally written reports.
   - Demonstrate the ability to conduct basic statistical error analysis.
   - Apply experimental data and insights to practical design problems.

   b. **Student Outcomes Addressed:**
   Each lab assignment contains a hypothesized issue or need for a realistic design problem. The lab experiment is assumed to be a prototype or small-scale model for the problem. Each report must include suggested design solutions to the problem based on test results and engineering principles. This course can support all outcomes except f; however, no outcomes are aligned specifically for the Spring 2017 Semester. Note: this course is used to support our Program Criteria; specifically the design realization and professional exposure in the thermal area.

7. Brief list of topics to be covered

- The ideal vapor compression refrigeration cycle using observation and operating data recording on a 2750-ton chiller serving multiple campus buildings. Calculated Coefficients of Performance reported to Campus Facility Operations.
- Free convection heat transfer from a heated fin and from a pipe with hot fluid flow inside.
- 2-D unsteady heat conduction in a square plate using temperature visualization with a thermochromic liquid crystal sheet and color camera, thermocouples, and comparison with a numerical simulation of the unsteady heat conduction equation.
- Convection and radiation from heated surfaces.
- Parallel and counter-flow heat exchangers.
- Data collection and analysis assignment involving boilers and chillers in the university campus power house. Calculated thermal efficiencies reported to campus Facility Operations.