I. Department, Number, and Title of Course:

Mechanical Engineering and Energy Processes, ME 401 (1), Thermal Measurements Laboratory

II. Designation as a 'Required' or 'Elective' Course: Required

III. Course (catalog) Description:

Study of basic measurements used in the thermal sciences. Calibration techniques for temperature and pressure sensors. Thermal measurements under transient and steady-state conditions. Applications include conduction, convection and radiation experiments, uncertainty analysis, handling and reduction of data.

IV. Prerequisite(s): ME 302

V. Textbook(s) and/or Other Required Material: Lectures and writing resources provided online.

VI. Course Objectives:

Basic measurements used in the thermal sciences will be studied in this course. Thermal measurements under transient and steady-state conditions will be performed. Applications include conduction, convection, radiation, psychrometrics, fluid dynamics, and refrigeration experiments. Uncertainty analysis, data acquisition and processing will also be covered.

VII. Topics Covered:

- 1. Making & Calibration of Thermocouples
- 2. Thermal Conductivity
- 3. Counter-Flow Heat Exchanger
- 4. Transient Heat Conduction
- 5. Radiation Heat Transfer
- 6. Refrigeration
- 7. Cooling Tower

VIII. Class/laboratory Schedule, i.e., number of sessions each week and duration of each session:

Meets at least twelve times during the semester for lectures lasting up to 1.5 hours and relevant to upcoming lab experiments. Lab sessions meet seven or more times during the course of the semester to conduct experiments

IX. Contribution of Homework, Quizzes, Tests, Laboratory Reports, or Research Papers:

Lab reports 80%, lab final 20%

X. Contribution of Course to Meeting the Professional Component:

The course focuses on conducting experimental laboratories by starting the experiment, collecting necessary data, and shutting down the experiment. Also the course teaches correct analysis of the collected data and determination of the accuracy of results. Advanced software applications are learned during this part of the course. The course also emphasizes technical writing and proper display of data/results in tables and graphs.

Engineering Science: 1 credit (100%), Engineering Design 0 credits (0%)

Outcome Code	Outcome Description	ME 401
ME-SO1	The ability to apply knowledge of mathematics, science and engineering to problem solving	S
ME-SO2	The ability to design and conduct experiments, as well as to analyze and interpret data	S
ME-SO3	The ability to design a system, component, or process to meet desired needs within realistic constraints	М
ME-SO4	The ability to function on multi-disciplinary teams	S
ME-SO5	The ability to identify, formulate and solve engineering problems	W
ME-SO6	An understanding of professional and ethical responsibility	W
ME-SO7	The ability to communicate effectively	S
ME-SO8	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	S
ME-SO9	A recognition of the need for and and ability to engage in life- long learning	W
ME-SO10	Knowledge of contemporary issues	W
ME-SO11	The ability to use the techniques, skills and modern engineering tools necessary for engineering practice	S

XI. Relationship of Course to Program Outcomes

S = Strong, M = Medium, W = Weak

XII. Person(s) who prepared this description and date of preparation: Alan Weston, September 2014