

**1. Department, Course Number, and Course Title:**

**MECHANICAL ENGINEERING**

**ME 315 THERMAL SYSTEMS LABORATORY**

- 2. Designation:** Required  Elective   
Lower Division  Upper Division
- 3. Course Description:** Experiments in heat transfer and thermodynamics; Thermophysical properties of fluids; analysis, operation, and performance testing of thermal energy conversion systems.
- 4. Prerequisites:** ME 306 (Heat Transfer I), ME 326a (Thermodynamics I)
- 5. Text and Materials:** Introduction to Heat Transfer, Fourth Edition, Frank P. Incropera and David P. DeWitt, John Wiley and Sons, 2002
- 6. Course Objectives:** The student will become familiar with instrumentation commonly used in heat transfer and energy conversion systems.

Course Outcomes

- an understanding and the ability to apply the fundamental principles of heat transfer, heat transfer and fluid mechanics
- the ability to measure fluid velocity, pressure and temperature
- the ability to measure the flow and heat transfer characteristics around a tube bundle
- the ability to measure heat transfer in a lumped capacity system
- the ability to measure and analyze the performance characteristics of a mechanical heat pump
- the ability to measure steady state temperature profiles in conduction
- the skills necessary to measure and analyze HVAC systems
- the ability to determine the convective heat transfer coefficients in circular pipes
- an understanding of thermal storage systems
- the ability to analyze internal combustion systems
- the ability to measure the properties of fluids

**7. Topics Covered:** (in Order of Presentation)

- Data Collection and Analysis
- Measurement of Fluid Properties
- Lumped Capacity Systems
- Analysis of Heat Transfer from Fins
- Temperature Measurements during Conduction Heat Transfer
- Measurements of Convective Heat Transfer Coefficients
- Analysis of Combined Conduction, Convection and Radiation Systems
- Analysis of a Vortex Tube
- Analysis of Heated Flow in a Wind Tunnel

- 8. Class Schedule:** Number of Sessions per week: 1  
Duration of each session: 2 hours 50 minutes

**9. Contribution of course to meeting the professional component:**

This course is a required laboratory course for the mechanical engineering program.  
Engineering Laboratory 1 unit

**10. Relationship of course to program objectives:**

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

**11. Prepared by:** Darrell Guillaume

05/2005