

Department of Mechanical Engineering
ME 406 – Mechanical Laboratory III
(Required)

Catalog Description: ME 406 (1-2-2)

An advanced laboratory course for mechanical engineering students. Covers the testing and evaluation of complete mechanical systems.

Prerequisites: ME 405 – Mechanical Laboratory II
ME 407 – Heat Transfer

Textbook(s) Materials Required:

1. J. P. Holman Experimental Methods for Engineers, Seventh Edition, McGraw – Hill 2001.
2. Mechanical Laboratory III Manual, ME web-site, 2006.

References (Not Required):

1. F.P. Incropera and D. P. DeWitt, An Introduction to Heat Transfer, Fourth Edition, John Wiley and sons, 2002.
2. Y. A. Cengel and M. A. Boles, Thermodynamics, Fifth Edition, McGraw-Hill, 2006.
3. W. T. Thompson, Theory of Vibrations with Applications, Fifth Edition, Prentice-Hall, 1998.

Course Supervisor: Dr. B. Koplik

Pre-requisite by topic

1. Thermodynamics and energy analysis
2. Internal combustion engine cycle analysis and evaluation
3. Refrigeration cycle analysis and performance characteristics
4. Forced and free convection heat transfer
5. Dynamics of vibrating systems

Course Objectives¹:

1. To develop the student's skills in testing and measuring procedures of complete mechanical systems (A,B,C,D,E).
2. To provide the student with the knowledge of the concepts of experimental engineering (A,B,C,D,E).
3. To reinforce the basic skills of effective written and oral communication of experimental methods, data and results (A,B,C,D,E).

Topics²:

1. Internal combustion engine performance (6 hrs)
2. Refrigeration cycles, evaluation of performance (6 hrs)
3. Forced and free convection heat transfer including phase change (9 hrs)
4. Performance of a concentric tube heat exchanger (6 hrs)
5. Dynamics of vibrating systems (6 hrs)
6. Design of an experiment for the purpose of comparing parameters of two refrigeration systems (9 hrs)

Evaluation Method:

1. Laboratory reports
2. Classroom performance
3. Final Exam

Schedule: Lecture/Recitation: 1 hour, per week
Laboratory: 2 hours, per week

Professional Component: Engineering Science/Engineering Design

Program Objectives Addressed: A, B, C, D, E

Course Outcomes³:**Objective 1**

1.1 Students will demonstrate an ability to conduct experiments in both thermal and mechanical systems. (1,2,3) (a,b,c,e,k)

1.2 Students will demonstrate the ability to evaluate the performance of the system. (1,2,3) (a,c,e,h,k)

Objective 2

2.1 Students will demonstrate the ability to plan and execute at least one system experiment. (1,2,3) (a,b,c,e,g,h,i,k)

Objective 3

3.1 Students will demonstrate the ability to prepare effective engineering reports with substantial computer usage and graphical content. (1,2) (a,b,c,e,g,h,i,k)

Prepared by: Dr. B. Koplik

Date: October 12, 2006

¹ Capital Letters in parenthesis refer to the Program Objectives of the Mechanical Engineering

Department. Listed in Sec 2 d Tables B-2-9, B-2-12. Table B-2-8 links Program Objectives with the ABET a-k Criterion.

² Topic numbers in parenthesis refer to lecture hours. (three hours is equivalent to 1 week)

³ Outcome numbers in parenthesis refer to evaluation methods used to assess the student performance.

Lower case letters in parenthesis refer to ABET a-k outcomes.