

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

**MECHANICAL ENGINEERING**

**ME 204 MECHANICAL MEASUREMENTS AND INSTRUMENTATION**

**2. Designation:** Required  Elective   
Lower Division  Upper Division

**3. Course Description:** Introduction to electrical circuits, engineering measurements and instrumentation, introduction to automatic control systems and components.

**4. Prerequisites:** PHYS 203

**5. Text and Materials:** Control Sensors and Actuators, Clarence W. deSilva, Prentice-Hall, 1989  
Electric Circuits, Nilson, 3<sup>rd</sup> Edition, Addison Wesley, 1993 (Supplemental text)

**6. Course Objectives:** To provide essential elements of electrical circuit analysis with a definite focus on Mechanical Engineering application. To provide an introduction to instrumentation and devices used for measurements in electromechanical systems and introduction to automatic control systems.

Course Outcomes

- an understanding of, and an ability to analyze and select electric circuit components including current and voltage sources, resistance, inductance, capacitance, and operational amplifier.
- an understanding of and an ability to apply analytical and computer-aided methods for solution of electrical circuits.
- an understanding of basic measuring devices including transformers, transducers, and pressure, flow rate, and temperature measurement devices.
- Methods for rating instrument devices including dynamic range, resolution, accuracy and precision, bandwidth.
- an understanding of the elementary concepts and elements of automatic and feedback control system
- an ability to communicate effectively.
- a desire to be a flexible and adaptable team player.

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

- Introduction to Electric Circuit elements (supplemental text) (Ch. 1)
- Resistive circuits and electric sources (supplemental text) (Ch. 2,3)
- Analysis methods (supplemental text) (Ch. 4)
- Circuits with energy storing elements(supplemental text) (Ch. 5,6,7)
- Introduction to instrumentation, measuring devices, and control (Ch. 1)
- Performance specification and component matching (Ch. 2)
- Motion measurement sensors (Ch. 3)
- Torque, force, and tactile measurement sensors (Ch. 4)
- DC-motors and actuators (Ch. 6,7)
- Introduction to automatic control systems

**8. Class Schedule:** Number of Sessions per week: 2  
Duration of each session: 1 hour 40 minutes

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

This course is part of the 68 units of lower division required courses for the mechanical engineering program.  
Engineering Science: 4 units

**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 how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to communicate effectively (abet g)
- an ability to think in a logical sequential process

Attitudes Outcome:

**11. Prepared by:** Maj Mirmirani

12/2005