1. Department, Course Number, and Course Title:

MECHANICAL ENGINEERING

ME 481 INTRODUCTION TO ROBOTICS

2. Designation:

Required	☐	Elective	☑
Lower Division	☐	Upper Division	☑

3. Course Description: General considerations of robotic manipulator; spatial description, homogeneous transformations; manipulator kinematics; inverse manipulator kinematics; motion trajectories; static forces.

4. Prerequisites: CE/ME320 (Dynamics I) or EE360 (Control Systems Theory I)

5. Text and Materials: Introduction to Robotics: Mechanics and Control, Third Edition, John J. Craig, Pearson Prentice Hall, 2005

6. Course Objectives: This course is intended to introduce to students the science and engineering of mechanical manipulation. Application of the theory for the analysis and design of industrial robots is emphasized. Students are required to develop computer models of the physical systems and use the models to solve open-ended design problems.

Course Outcomes

- the ability to analyze motions of mechanical manipulators.
- the ability to perform a complete dynamic force analysis of a robot.
- the ability to tackle problems involved in the design of manipulators.
- the ability to obtain computer solution by using commercial software.
- an ability to write a brief engineering report for a term project.

7. Topics Covered: (in Order of Presentation)

- Coordinate transformation
- Manipulator kinematics
- Manipulator inverse kinematics
- Static forces and Jacobians
- Manipulator dynamics
- Trajectory generation
- Manipulator design

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 24 units of technical electives required for the mechanical engineering program.

Engineering Science	3 units
Engineering Design	1 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:

- a knowledge of computer aided design and simulation software

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)

- 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:

11. Prepared by: Lih-Min Hsia 05/2005