METROPOLITAN STATE COLLEGE *of* DENVER
Office of Academic Affairs

REGULAR COURSE SYLLABUS

School of: Professional Studies

Department: Engineering Technology

Prefix & Course Number: EET 4730   **Crosslisted With*:** _____

Course Title: Robotics

Check All That Apply: Required for Major: _____   Required for Minor: _____   Specified Elective: X

Required for Concentration: _____   Elective: X   Service Course: _____

Credit Hours: 3 (3+0)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 45   Lab 0   Internship _____   Practicum _____ Other (please specify type and hours): _____

Schedule Type(s): L **Grading Mode(s):** L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned**):

_____

** NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): _____

Prerequisite(s): (EET 2145 or EET 3010,) EET 3740, and MTH 2410, with grades of "C" or better.

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

Banner Enforced:
    Prerequisite(s): (EET 2145 or EET 3010,) EET 3740, and MTH 2410, with grades of "C" or better.
    Corequisite(s): _____
    Prerequisite(s) or Corequisite(s): _____

Catalog Course Description:
This course covers the basics of design, analysis, modeling and control of robots. The topics covered include: robot kinematics, inverse kinematics, kinetics, sensors, actuators, and the industrial applications of robotics.

APPROVED: _____   3/1/2011
Department Chair OR Program Director   Date

_____   3-11-11
Dean OR Associate Dean   Date

_____   6/2/11
Associate VP, Academic Affairs   Date

*If crosslisted, attach completed Course Crosslisting Agreement Form

Prefix and Course Number: EET 4730

Required Reading and Other Materials will be equivalent to:
Spong, Hutchinson, Vidyasagar. (2005) *Robot Modeling and Control*. Hoboken, NJ: John Wiley

Specific, *Measurable* Student Behavioral Learning Objectives:
Upon completion of this course the student should be able to:
1. Analyze robots and robot subsystems.
2. Design basic electronics for robots.
3. Perform kinematic and inverse kinematics on robot manipulators.

Detailed Outline of Course Content (Major Topics and Subtopics) **or Outline of Field Experience/Internship (experience, responsibilities and supervision):**

I. Overview
   A. Introduction
   B. Terminology
   C. Manipulator Geometrics
   D. Types of Manipulators
   E. Components of System

II. Sensing Position and Velocity
   A. D/A
   B. A/D
   C. Analog Measurements
   D. Digital Measurements
   E. Direction Determination
   F. Design Alternatives

III. Noise (very brief)

IV. Actuators
   A. D.C. Motor
   B. Step Motor
   C. Hydraulic Actuators
   D. Pneumatic Actuators

V. Industrial Applications

VI. Coordinate Systems of Robot

VII. Kinematics
   A. Hand and Joint Relations
   B. Inverse Problem
   C. Arm Solution

VIII. Jacobian
   A. Differential Motion
   B. Jacobian
   C. Inverse Jacobian

IX. Path Control
   A. Recording
   B. Cartesian
   C. Joint Interpolated

X. Kinetics (brief)
   A. Deriving
   B. Forces and Torques
   C. Complexity
   D. Kinetic Equation Application

XI. Force Control and Compliance

XII. Sensors:
   A. Touch
   B. Proximity
   C. Ranging
   D. Others

XIII. Vision
   A. Fundamentals
   B. Image Acquisition
   C. Image Processing
   D. Segmentation
   E. Shape Descriptors
   F. Illumination

XIV. Robotic Computer Architecture (brief)
   A. Hardware Aspects
   B. Software Aspects
   C. Hierarchal Control

XV. Robot Programming Languages (very brief)

XVI. Artificial Intelligence (brief)

Evaluation of Student Performance:
1. Written exams
2. Homework
3. Presentations
4. Lab Reports