THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Mechanics and Control of Robots

MECHENG 7752

Credit Hours:
3.00 - 3.00

Course Levels:
Graduate (5000-8000 level)

Course Components:
Recitation
Lecture

Course Description:
Introduction to the mechanical and mathematical principles of robotics including kinematics, rigid body dynamics, control theory, motion planning, sensors and actuators, legged locomotion and manipulation.

Prerequisites and Co-requisites:
Prereq: 2030 (430), Math 2174, 2415 (415), 4568 (568), 571, or equiv, or Grad standing in Engineering.

Course Goals / Objectives:
- Be able to model, understand, and analyze the kinematics, dynamics, and control of robots
- Given a task, pick robot morphology and design a control system to perform the required task
- Through project presentations and special topics, become familiar with the state of the art in applied robotics
- Be able to use MATLAB (or other programming environment) in the modeling and analysis of robots and other dynamical systems

Course Topics:
- Introduction to robots and robot applications
- Position and orientation representation, coordinate frames, rotation matrices, homogeneous transforms, Euler angles, etc.
- Forward manipulator kinematics: Denavit-Hartenberg representation, range of motion
- Inverse kinematics, numerical solution of nonlinear equations, kinematic path tracking, trajectory generation.
- Manipulator mechanism design
- Rigid body dynamics: Newton-Euler and Lagrangian formulations
- Linear position and trajectory control, force control, nonlinear control
- Sensors and actuators
- Collisions, friction, and other mechanics modeling issues
- Bipedal robot locomotion and other special topics.

Designation:
Elective