



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Design and Manufacturing of Compliant Mechanisms and Robots

MECHENG 5751

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Introduces methods and theories for kinematic and force analysis, synthesis of rigid body and compliant (flexible) mechanisms and robots. Pseudo-rigid-body model and CAD/CAE software will be used for modeling and analysis study. Students will be required to work on a team project to solve a real world design problem related to mechanisms and robots.

Prerequisites and Co-requisites:

Prereq: 3670 or equiv, or Grad standing in Engineering, or permission of instructor.

Course Goals / Objectives:

- Ability to perform position, velocity and static force analysis of rigid body mechanisms and robots
 - Ability to perform algebraic synthesis of rigid body mechanisms
 - Ability to develop pseudo-rigid-body models of compliant mechanisms
 - Ability to understand force-deflection relationships of rigid body and compliant mechanism
 - Ability to perform kinematic and static force analysis of compliant mechanisms using energy and principle of virtual work
 - Ability to use computer-aided engineering software to model and evaluate rigid body and compliant mechanisms
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Course Topics:

- Planar kinematics, vector/matrix algebra, complex number approach
 - Positional analysis of planar linkages and robots
 - Range of motion of planar linkages
 - Velocity and force analysis of linkages and robots
 - Algebraic synthesis of rigid body linkages
 - Computer-aided design of mechanisms and robots Machine dynamics simulation
 - Flexibility, deflection, material properties
 - Elastic analysis of cantilever 2D beams
 - Pseudo-rigid-body model
 - Force-deflection relationships, principle of virtual work
 - Special purpose mechanisms: constant-force mechanisms, bistable mechanisms
 - Design optimization of compliant mechanisms
 - Manufacturing methods and lab: 3d printer, CNC mill, SDM, mold design, plastic and soft parts
 - Project fabrication
 - CAD and CAE modeling
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Designation:

Elective