

MECH3030 Mechanisms of Machinery

Course Code: MECH3030	Course Title: Mechanisms of Machinery
Required Course Or Elective Course: required	Terms Offered (Credits): Fall (3 credits)
Faculty In Charge: Yi-Kuen Lee, Jungwon Seo	Pre/Co-Requisites: MECH2020
Course Structure: Lecture: 2 days per week, 1.5 hours per lecture	
Textbook/Required Material: (1) lecture notes, (2) Kinematics and Dynamics of Machinery, R. Norton, McGraw-Hill (3) Kinematics, Dynamics, Design of Machinery, K. Waldron et al., Wiley	
Bulletin Course Description: Application of kinematics in the analysis and synthesis of mechanisms. Type and dimensional design of linkages, cams and gears based on motion requirements and kinetostatic force transmission, in contrast to the strength requirements. Graphical, analytical and computer methods in analysis and design of mechanisms. Design considerations in mechanism synthesis.	
Course Topics: <ol style="list-style-type: none">1. Fundamentals: types of links and joints, degrees of freedom, mobility, inversion isomers, Grashof's criterion,2. Position analysis: loop closure, closed - form & iterative solutions,3. Velocity analysis: vector polygons, instant centers, algebraic method,4. Acceleration Analysis: vector polygons, algebraic method, Coriolis acceleration,5. Graphical linkage synthesis for 2 and 3 positions,6. Analytical linkage synthesis for 2 & 3 positions,7. Code of ethics for engineers, cam design (follower motion synthesis, cam profile design) and applications to automotive engineering (BMW Valvetronic, Toyota VVT-i, etc.)8. Gears (types, gear terminology and standards, law of gearing, interference),9. Gear train analysis (simple, compound, and planetary) and applications	
Course Objectives:	<ol style="list-style-type: none">1. Develop an understanding of various classes of linkages, concepts of mobility and function2. Develop knowledge of basic graphical and analytical methods of linkage synthesis3. Develop a working knowledge of a linkage design and analysis software package4. Develop ability to perform position, velocity, acceleration and force analysis on linkages and machines5. Develop an understanding of the basic balancing techniques of rotating machinery
Course Outcomes:	On successful completion of this course, students are expected to be able to: <ol style="list-style-type: none">A. Analyze the basic relative kinematics relations of two moving points.B. Identify individual links.C. Identify and categorize the type of connection of the links (joints).D. Develop analytical equations describing the relative position, velocity and acceleration of all moving links.

	<ul style="list-style-type: none">E. Identify all reaction and inertia forces on the links.F. Apply the fundamentals of mechanisms to specific link and joint combinations such as cams and gear systems.G. Describe standards in gear and cam machine components.H. Analyze and design two-dimensional (otherwise complex) cam and gear system.
Assessment Tools:	<ul style="list-style-type: none">1. Regular homework problems - 20%2. Mid-term and Final exams - 80%