

COURSE NUMBER	ME 231		
COURSE TITLE	Kinematics of Machinery		
COURSE STRUCTURE	(3-0-3) (lecture hr/wk - lab hr/wk - course credits)		
COURSE COORDINATOR	Dr. Raj S. Sodhi		
COURSE DESCRIPTION	Design, selection, and evaluation of mechanisms for various applications. Topics include displacement, velocity, and acceleration analysis of planar linkages, synthesis of function generators and motion generators, design of cams, gear-tooth geometry, and analysis of gear trains		
PREREQUISITE(S)	CIS 101, Mech 234 and access to MATLAB and SimMechanics (version 2013 or later)		
COREQUISITE(S)	None		
REQUIRED, ELECTIVE OR SELECTIVE ELECTIVE	Required		
REQUIRED MATERIALS	TEXTBOOK: K. Russell, Q. Shen and R.S. Sodhi, <i>"Kinematics and Dynamics of Mechanical Systems: Implementation in MATLAB and SimMechanics, CRS Press, Boca Raton 2015</i>		
OTHER SUPPLEMENTAL	none		
MATERIALS COMPUTER	Matlab demonstrations		
USAGE COURSE LEARNING OUTCOMES/ EXPECTED PERFORMANCE CRITERIA:			
	Course Learning Outcomes	SOs*	Expected Performance Criteria
	1 Calculate the degree of freedom of a mechanism	a, c	Exam Question (80% of the students will earn a grade of
	2. Identify the mobility of a four-bar mechanism	a, c	70% or better on this question) Exam Question (80% of the students will earn a grade of
	3. Calculate the extremes of the transmission angle in a crank-and-rocker mechanism	a, c	70% or better on this question) Exam Question (80% of the students will earn a grade of
	4. Calculate the displacements of a planar mechanism	a, c, e, k	70% or better on this question) Exam Question (80% of the students will earn a grade of
	5. Apply Freudenstein's Equation in the analysis of a four-bar mechanism	a, c, e, k	70% or better on this question) Exam Question (80% of the students will earn a grade of
	6. Synthesize a four-bar mechanism motion generator for two or three positions of a moving plane	a, c, e, k	70% or better on this question) Exam Question (80% of the students will earn a grade of
	7. Synthesize a four-bar mechanism function generator for three precision	a, c, e, k	70% or better on this question) Exam Question (80% of the students will earn a grade of

	points using Freudenstein’s equation		70% or better on this question)								
	8. Calculate the velocities of planar mechanism	a, c, e, k	Exam Question (80% of the students will earn a grade of 70% or better on this question)								
	9. Calculate the accelerations of planar mechanism	a, c, e, k	Exam Question (80% of the students will earn a grade of 70% or better on this question)								
	10. Design a cam for a specified follower motion	a, c, e, k	Exam Question (80% of the students will earn a grade of 70% or better on this question)								
	11. Design a gear train for a desired speed ratio	a, c, e	Exam Question (80% of the students will earn a grade of 70% or better on this question)								
	12. Calculate the speed ratio of a planetary gear train	a, c, e, k	Exam Question (80% of the students will earn a grade of 70% or better on this question)								
CLASS TOPICS	1. Mechanisms and Machines - degrees of freedom, Grashof’s rule, transmission angle, limiting positions 2. Displacement analysis 3. Linkage synthesis 4. Velocity analysis 5. Acceleration analysis 6. Cams - displacement, velocity, acceleration and jerk analysis of cam follower motion, polynomial cams 7. Spur gears, gear terminology, speed ratios 8. Involutometry 9. Planetary gear trains 10. Exams										
STUDENT OUTCOMES (SCALE: 1-3)	a	b	c	d	e	f	g	h	i	j	k
	3		3		2						2
	3 - Strongly supported 2 - Supported 1 - Minimally supported										

* Student Outcomes