UMBC UGC New Course Request: ENME 460: Kinematics and Mechanism Design

Date Submitted: November 2, 2009 Proposed Effective Date: Fall 2010

	Name	Email	Phone	Dept
Dept Chair	Shlomo Carmi	carmi@umbc.edu	5-3330	Mech. E.
Contact	Charles Eggleton	eggleton@umbc.edu	5-3334	Mech. E.

COURSE INFORMATION:

Course Number(s)	ENME 460
Formal Title	Kinematics and Mechanism Design
Transcript Title (≤24c)	Kine and Mech Design
Recommended Course Preparation	ENME204, ENME221, ENME303, ENME304
Prerequisite	ENME 303
Credits	3
Repeatable?	☐ Yes X No
Max. Total Credits	3
If yes, how many total credits?	
Grading Method(s)	X Reg (A-F) ☐ Audit ☐ Pass-Fail

PROPOSED CATALOG DESCRIPTION:

This course focuses on the kinematic analysis and mechanism design. Extensive kinematic concepts and theories including Gruebler's mobility analysis, Grashof criteria, kinematic analysis and kinematic synthesis will be covered. These kinematic fundamentals will be applied to solve a real-world mechanism design problem. Students are assigned both an individual analysis project and a team design project and required to complete a design realization and technical report.

RATIONALE FOR NEW COURSE:

a) Why is there a need for this course at this time?
A: This course is a fundamental course on machine design of system level. The course will help student understand how a machine works and how to design a machine.
b) How often is the course likely to be taught? A:once per year, best each fall semester.
c) How does this course fit into your department's curriculum?
A: This course is design course. Students are required to accomplish a design project and deliver a design prototype (in either physical model or rapid prototype)
d) What primary student population will the course serve?
A: The course will have a maximum enrollment of 30 students. Course enrollment for Fall 2009 semester was full. The enrollment capacity was increased to 24.
e) Why is the course offered at the level (ie. 100, 200, 300, or 400 level) chosen?
A:This is offer at 400 level because it requires advanced mathematics skills (ENME303) and knowledge about dynamics (ENME221) and design methodology (ENME204)
f) Explain the appropriateness of the recommended course preparation(s) and prerequisite(s).
A:This course requires math skills especially vector/matrix analysis, hence require (ENME303). It also requires dynamics and design methodology. However they are prerequisites of NEM303.
g) Explain the reasoning behind the P/F or regular grading method.
A: The course is a regular grading course as it grading involves 7-8 hw sets, two projects and two exams.
h) Provide a justification for the repeatability of the course.
A:It should not be repeated as it is a senior optional course.

ATTACH COURSE OUTLINE (mandatory):

Week	Date	Topic	Reading	Due
1	09/03(W)	Travel, class cancelled		
2	09/09(W)	**Kinematic fundamentals**	Ch1, Ch2	
3	09/14(M) 09/16(W)	**Position analysis** **Position analysis**	Ch4 Ch4	 HW1
4	09/21(M) 09/23(W)	**Position analysis** **Position analysis, Matlab tutorial**	Ch4 Ch4	 HW2
5	09/28(M) 09/30(W)	**Velocity analysis** **Velocity analysis**	Ch6 Ch6	 HW3
6	10/05(M) 10/07(W)	**Acceleration analysis** **Acceleration analysis**	Ch7 Ch7	 HW4
7	10/12(M) 10/14(W)	WorkingModel tutorial **Quiz 1**		
8	10/19(M) 10/21(W)	**Linkage synthesis** **Linkage synthesis**	Ch3 Ch3	 Mini-Project
9	10/26(M) 10/28(W)	**Introduction to entrepreneurship** **Cams**	 Ch8	 HW5
10	11/02(M) 11/04(W)	**Cams** **Cams**	Ch8 Ch8	*Design problem*
11	11/09(M) 11/11(W)	**Gears** Gears	Ch9 Ch9	*Design proposal** HW6
12	11/16(M) 11/18(W)	**Innovation and creative design** Design project meeting		 HW7
13	11/23(M) 11/25(W)	**Quiz 2** Design project meeting		 *Concept generation*
14	11/30(M) 12/02(W)	Design project meeting Design project meeting		
15	12/07(M) 12/09(W)	Design project meeting Design project meeting		 *CAD model**
16	12/14(M)	**Marketing skills**		
Final	12/21(M)	***Final Demo (full course)*** 6:00pm-8:00pm, in the normal classroom		*Design report**, *prototype**

Assessment: The relative weighting of these performance factors is:

25% -- Homeworks: There will be about 7 hw sets which are usually assigned on Wednesday and due the beginning of the following Wednesday class. Late submission will NOT be accepted.

10% -- One mini-project. This **individual** project will be on the use of computers for the kinematic analysis of planar linkages.

- 30% -- Quizzes: (2 @ 15% each), closed book
- 35% -- **Team design project**. See design project for details.

The grading scale will be:

A Above 90%;
B 80% up to but not including 90%;
C 70% up to but not including 80%;
D 60% up to but not including 70%;

F Below 60%.

ABET-RELATED COURSE OUTCOME WORKSHEET (COW)
ENME 489T – Fall 2009

Course Goals	**Supports ABET Outcomes**	**Activity**	**Basis for Assessment**
The student will learn how to apply fundamental kinematic concepts to the analysis of mobility, Grashof criteria of 4-bar mechanisms	a,e	Lecture Classroom examples	Student assessment, instructor assessment, graded homework, quizzes
The students learn how to perform position, velocity and acceleration analysis of planar mechanisms	a,e	Lecture Classroom examples Mini-project	Student assessment, instructor assessment, graded homework, quizzes, Mini-project report
Students learn how to use Matlab and WorkingModel 2D for mechanism analysis and design	k	Tutorial Mini-project	Student assessment, instructor assessment, graded mini-project report
Student learn how to synthesize planar linkages using either graphical or analytical approach	a,c,e	Lecture Classroom examples Design-project	Student assessment, instructor assessment, graded homework, quizzes, design-project report
Students learn how to design cam profiles to produce specified motion	a,c,e	Lecture Classroom examples Design-project	Student assessment, instructor assessment, graded homework, quizzes, design-project report
Students learn how to analyze and design simple and planetary gear trains	a,c,e	Lecture Classroom examples Design-project	Student assessment, instructor assessment, graded homework, quizzes, design-project report
Students learn how to work in a team environment to accomplish a design task.	c,g	Team discussion Design-project Design demo	Oral presentation of design-project, written reports and design demo.
Students learn how to communicate effectively in the form of oral presentations and formal technical reports.	g	Team discussion Design-project Design demo	Oral presentation of design-project and written reports.