MEC 310 (Introduction to Machine Design) Fall 2017

Course Administration

INSTRUCTOR:	Nilanjan Chakraborty, 212 Heavy Engineering, (631) 632 9327. E-mail: nilanjan.chakraborty@stonybrook.edu
TEACHING ASSISTANT:	Priya Priyadarshini (priya.priyadarshini@stonybrook.edu) Miguel Vazquez (miguel.vazquez@stonybrook.edu)
LECTURE HOURS:	Tuesday and Thursday (5:30 PM – 6:50 PM) (102 Javits Lecture Hall).
OFFICE HOURS:	Tuesday and Thursday (3:30 PM – 5:00 PM) or by appointment (212 Heavy Engineering).
REQUIRED TEXT:	**Design of Machinery: An introduction to the synthesis and analysis of mechanisms and machines**, Robert Norton, McGraw-Hill.
PREREQUISITES:	MEC 262, MEC102; CO-REQUISITE: MEC 203.
HOMEWORK:	About one homework assignment per week. Homework is due one week after it is assigned. Late homework will **not** be accepted, unless you have made prior arrangements with me.
PROJECTS:	Two design projects will be given. Each is due four weeks following its assignment unless otherwise stated. A written report is required for each design project.
EXAMS:	2 Midterms and 1 Final Exam. **Exam # 1: Thursday 10/12/2017; Exam # 2: Thursday 11/30/2017.** **Final Exam: Tuesday 12/19/2017, 11:15AM – 1:45 PM.** • All midterm exams will be scheduled in class. • No makeup exam unless arranged prior to the exam.
GRADING:	Semester letter grade is based upon your performance in the following: Homework 15% Projects 20% 2 Exams @ 15% each 30% Final (comprehensive) 35%
GRADING SCALE	Not a curve – accumulation of your course work, as follows: A (100-94) A- (93-90) B+ (89-87) B (86-82) B- (81-79) C+ (78-76) C (75-72) C- (71-68) D+ (67-64) D (63-60) F (59 or below).

It is important to note that in addition to the above grading scale, for you to earn a passing grade in this class, you will also have to earn a passing grade (60/100 percentile) in all design projects. The reports are graded using rubrics that will be made available to you in class. Failure to comply with this requirement of design reports will result in a letter grade of "F" regardless how well you have done in all other categories.

STUDENT OUTCOMES

(a) Ability to apply knowledge of mathematics, science, and engineering.

(e) Ability to identify, formulate, and solve engineering problems.

(m) Ability to model, analyze, design, and realize physical systems, components, or processes.

(n) Ability to work professionally in both thermal and mechanical systems areas.

COURSE LEARNING OBJECTIVES	**SOs**	**ASSESSMENT TOOLS**
Know how to determine the mobility of a mechanism	M	Exam questions
Know how to synthesize a linkage by using graphical methods	e,m	Exam questions
Know how to analyze the movement of a linkage using loop closure equations	a,m	Exam questions
Know how to analyze the velocity and acceleration of a linkage using vector equations	a,m	Exam questions
Know how to design a cam profile from a given displacement curve graphically	a,m, n	Exam questions
Know how to analyze a compound gear train	m,n	Exam questions
Know how to analyze an epicyclic gear train	m,n	Exam questions
Know how to formulate and solve a mechanism design problem	E	Rubrics of evaluation on design report

Course Overview

Major topics of this course include the analysis of mechanisms in order to determine their kinematic and dynamic behavior, and the synthesis of mechanisms in order to accomplish desired motions or tasks. These topics are fundamental to the broader subject of machine design.

The prerequisites for the present course are MEC 102 (Engineering Computing and Problem Solving II) and Engineering Dynamics (MEC 262). MEC 203 (Engineering Graphics and CAD) is a co-requisite. The kinematic and dynamic analyses (velocity, acceleration, and force analyses) of machinery are essentially applications of the fundamentals presented in MEC 262. The results of these analysis, i.e., forces acting on each machine component, are important for a following course, Mechanical Design (MEC 410), in which the students will learn how to size or design machine components to prevent mechanical failure.

Tentative Schedule

WEEK	MATERIAL COVERED	Text Chapters
1	Introduction and Kinematics Fundamentals Mechanisms and machines, Engineering design process, Degrees of freedom, The Grashof condition, Linkage inversion, Practical considerations.	Ch.1, 2
2,3	Graphical Linkage Synthesis Classification of kinematic synthesis problems, Dimensional synthesis involving 2 and 3 positions, quick return mechanisms.	Ch. 3
4,5	Linkage Analysis Loop closure equations for four-bar linkages and slider-crank linkages, Transmission angles, toggle positions. Velocity and acceleration analysis.	Ch. 4,6,7
6	Analytical Linkage Synthesis 2 and 3 position synthesis, comparison of analytical and graphical synthesis	Ch. 5
7	**Exam # 1: Thursday 10/12/2017**	
8,9	Cam Design Various mechanisms, Cam classification, Cam motion programs, Graphical design and analytical design of cams.	Ch. 8
10	Gears and Gear Trains The Fundamental Law of Gearing, Interference and undercutting, Design of gear trains.	Ch. 9
11	Static and Dynamic Force Analysis of Mechanisms	Ch. 11
12	Balance of Machinery	Ch. 12
13	Thanksgiving Break!	
14	**Exam # 2: Thursday 11/30/2017**	
15	Wrap-up and Review	

December 8 last day of class;
Final Exam (comprehensive): December 19 (Tuesday) 11:15 PM – 1:45 PM

BLACKBOARD: All homework assignments and solutions will be posted on the Blackboard course account. For problems logging in, go to the helpdesk in the Main Library SINC Site or the Union SINC Site, you can also call: 631-632-9602 or e-mail: helpme@ic.sunysb.edu

I will use email and blackboard exclusively to communicate with you off class. It is your responsibility to make sure that your email id is a current one on the blackboard system. I suggest that you use a university email id for this class; it is free and official. I am not responsible for the emails not delivered to your commercially available email accounts.

ACADEMIC HONESTY: The campus policies on academic honesty are available on the Web (http://www.stonybrook.edu/commcms/academic_integrity/policies.html).
Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work that is not originally yours. Examples include, *but are not limited to*, copying or plagiarizing class assignments including homework, reports, designs, computer programs, graphics, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the CEAS CASA committee. For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn.

Americans with Disabilities Act: If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC(Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.http://studentaffairs.stonybrook.edu/dss/index.shtml.