

Course Administration

MEC 310 (3 credits): Application of graphical and analytical methods to the analysis and synthesis of mechanism. Covers concepts of degrees of freedom, graphical and analytical linkage synthesis, position, velocity, acceleration, and force analysis of linkage mechanisms. Introduces principles behind the operation of various machine elements such as gears and gear trains, cams, flywheels and their design, and analysis techniques.

Prerequisites: MEC 102 or CSE 114 or 130 or ESG 111 or BME 120 or ESE 124; C or better in MEC 262 (or BME 260 for BME majors); Pre- or Corequisite: MEC 203 (ESG 316 for ESG majors)

INSTRUCTOR:	Jeff Ge, 113 Light Engineering E-mail: Qiaode.Ge@stonybrook.edu								
TEACHING ASSISTANT:	N/A								
LECTURE HOURS:	Monday and Wednesday (2:40 PM – 4:00 PM) (SBS N014).								
OFFICE HOURS:	Tuesday and Thursday (1:30 PM – 3:00 PM) or by appointment (113 Light Engineering).								
REQUIRED TEXT:	Design of Machinery: An introduction to the synthesis and analysis of mechanisms and machines , Robert Norton, 6 th Edition or later, McGraw-Hill.								
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 the instruct.								
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 <ul style="list-style-type: none">• 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: <table><tr><td>Homework</td><td>15%</td></tr><tr><td>Projects</td><td>20%</td></tr><tr><td>2 Exams @ 15% each</td><td>30%</td></tr><tr><td>Final (comprehensive)</td><td>35%</td></tr></table>	Homework	15%	Projects	20%	2 Exams @ 15% each	30%	Final (comprehensive)	35%
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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)	

COURSE LEARNING OBJECTIVES	ASSESSMENT TOOLS
Know how to determine the mobility of a mechanism	Exam questions
Know how to synthesize a linkage by using graphical methods	Exam questions
Know how to analyze the movement of a linkage using loop closure equations	Exam questions
Know how to analyze the velocity and acceleration of a linkage using vector equations	Exam questions
Know how to design a cam profile from a given displacement curve graphically	Exam questions
Know how to analyze a compound gear train	Exam questions
Know how to analyze an epicyclic gear train	Exam questions
Know how to formulate and solve a mechanism design problem	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	<u>Introduction and Kinematics Fundamentals</u> Mechanisms and machines, Engineering design process, Degrees of freedom, The Grashof condition, Linkage inversion, Practical considerations.	Ch.1, 2
2,3	<u>Graphical Linkage Synthesis</u> Classification of kinematic synthesis problems, Dimensional synthesis involving 2 and 3 positions, quick return mechanisms.	Ch. 3
4,5	<u>Linkage Analysis</u> Loop closure equations for four-bar linkages and slider-crank linkages, Transmission angles, toggle positions. Velocity and acceleration analysis.	Ch. 4,6,7
6	<u>Analytical Linkage Synthesis</u> 2 and 3 position synthesis, comparison of analytical and graphical synthesis	Ch. 5
7	Exam # 1: Wednesday 3/9/2021	
Spring Recess: 3/14-3/20		
8-10	<u>Cam Design</u> Various mechanisms, Cam classification, Cam motion programs, Graphical design and analytical design of cams.	Ch. 8
11	<u>Gears and Gear Trains</u> The Fundamental Law of Gearing, Interference and undercutting, Design of gear trains.	Ch. 9
12	Exam # 2: Wednesday 4/20/2021	
13	Static and Dynamic Force Analysis of Mechanisms	Ch. 11
14	<u>Balance of Machinery</u>	Ch. 12
15	<u>Wrap-up and Review</u>	

Final Exam (comprehensive): May 18 (Wednesday), 11:15am—1:45pm.

It is the responsibility of the student to plan class schedules to avoid conflicts with final exams and regularly scheduled classes.

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.

Student Accessibility Support Center Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center. For procedures and information go to the following website: <https://ehs.stonybrook.edu//programs/fire-safety/emergency-evacuation/evacuation-guide-disabilities> and search Fire Safety and Evacuation and Disabilities.

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

Until/unless the **latest COVID guidance** is explicitly amended by SBU, during Spring 2022 "disruptive behavior" will include refusal to wear a mask during classes.

For the latest COVID guidance, please refer to:

<https://www.stonybrook.edu/commcms/strongertogether/latest.php>