SAN JOSÉ STATE UNIVERSITY
Department of Mechanical Engineering

ME 101 Dynamics
Spring 2022

Prerequisites: CE 95 or CE 99 and Math 32 (with a grade of C- or better in each)

Credit Units: 3 units

Instructors:

Section 1 (21265)	TR: 10:30 – 11:45 AM	Prof. Zaidi
Section 2 (21941)	TR: 1:30-2:45 PM	Hybrid: Prof. R. Agarwal
Section 3 (22296)	TR: 3:00 – 4:15 PM	Prof. Armani
Section 4 (30804)	MW: 3:00 – 4:15 PM	Hybrid: Prof. R. Agarwal

Course Coordinator: Prof. R. Agarwal, email: raghu.agarwal@sjsu.edu

Contact Information

Prof. Agarwal 310 D	raghu.agarwal@sjsu.edu
Prof. Zaidi	syed.zaidi@sjsu.edu
Prof. Armani	amir.armani@sjsu.edu

Dr. Agarwal's Office hours: T Th 4:30 – 5:30 and by appointment

Prerequisite: Math 32 and CE 99 or equivalent

Course Description
Vector Mechanics. Motion of particles and rigid bodies. Force, energy, and momentum principles applied to particles and rigid bodies.

Course Format
This class requires the use of Canvas, so you will need access to the internet. All assignments during the semester will require the use of a computer for class assignments, in-class problem solving, Mid-term and Final Exam, etc. Electronic communication with your instructor and teammates is also required.

Recording Zoom Classes

This course or portions of this course may be recorded for instructional or educational purposes. The recordings will only be shared with students enrolled in the class through Canvas. The recordings will be deleted at the end of the semester.

Instructor Materials

Materials created by the instructor for the course (syllabi, lectures and lecture notes, presentations, etc.) are copyrighted by the instructor. This university policy (S12-7) is in place to protect the privacy of students in the course, as well as to maintain academic integrity through reducing the instances of cheating. Students who record, distribute, or post these materials will be referred to the Student Conduct and Ethical Development office. Unauthorized recording may violate university and state law. It is the responsibility of students that require special accommodations or assistive technology due to a disability to notify the instructor.

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Required Text

Vector Mechanics for Engineers - Dynamics,12th Edition, McGraw Hill Education, by Beer, Johnston, Cornwell, and Self

Grading Metrics:		
	Homework	5% (from Connect)
	Midterms	20% (Particle Dynamics)
	Pre-class Quizzes	35% (Reading, Quizzes)
	Pre-Class Videos	1% (watch video and take a quiz)
	In class Problems	10% (Problem Solving)
	Book Smart Reading	4% (On Connect)
	Final Exam	25% (Comprehensive)

NOTE: Classes are held on Zoom. The midterm and final exams are in-person, on campus. The Room numbers will be announced later. The exams are closed book and closed notes.

Grading Scale

95-100 A+, 90-94 A, 87-89 A-, 85-86 B+, 80-84 B, 77-79 B-, 75-76 C+,70-74 C,
67-69 C-, 65-66 D+, 60-64 D, 57-59 D-, Below 57 F

Course Goals

1. To learn fundamental concepts and principles of particle and rigid body motion kinematics
2. To learn fundamental concepts and principles of particle and rigid body kinetics
3. Application of Newton's second law to solve problems in particle and rigid body dynamics
4. In the context of B.S. Mechanical Engineering program assessment, this course is intended to help students achieve ABET Student Outcome 3a: "an ability to apply knowledge of mathematics, science, and engineering." For more information on ABET Student Outcomes, please see http://www.abet.org/eac-criteria-2016-2017/.

Student Learning Objectives

Upon successful completion of this course, the student should be able to:

1. Distinguish kinematics and kinetics in dynamics of solids
2. Develop analytical models for a given dynamic situation using particle and rigid body dynamics theories.
3. Characterize a motion to be rectilinear, curvilinear, planar rigid body dynamics.
4. Describe the motion of a particle in terms of kinematics for general curvilinear motion as well as in moving reference frames.
5. Apply Newton's Second Law in solving particle and rigid body dynamics problems.
6. Apply principle of energy and momentum principles in solving problems involving Particles; application of energy method for 2-D motion.
7. Apply vector mechanics, differential equations and integral calculus as needed in modeling and solving dynamics of engineering systems.

University Policies

Per University Policy S16-9 *(http://www.sjsu.edu/senate/docs/S16-9.pdf)*, relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on Syllabus Information web page (http://www.sjsu.edu/gup/syllabusinfo), which is hosted by the Office of Undergraduate Education. Make sure to visit this page to review and be aware of these university policies and resources

Course Requirements and Assignment
For students majoring in Mechanical Engineering, the passing grade in this course is a C-. Any ME major receiving a grade lower than C- will be placed on probation and will be allowed another attempt to pass the course with a grade of C- or better. Failure to pass this course in two successive attempts will result in disqualification from the ME program. Non-ME majors do not have this requirement.

This class uses the proven effective method of learning a difficult subject. It uses the flipped class mode, in which you learn the subject by an active participation in class and a pre-class preparation by reading and working on simple quizzes.

To help you with the homework, pre-class quizzes, and any conceptual questions, a tutor has been appointed. You can contact him by phone or email. The contact information is given at the end of this syllabus.

Overview of the Course Structure: This course has three main components:

a. Pre-class Activities
To be successful in this course (and in general, any course), you must come prepared in the regularly scheduled classes; you will better understand the material being covered in the class. The pre-class activities will require you to spend **one to two hours** of reading and working on the quiz (depending on your math and physics background, it may take less or more time) and sometimes watching a short video lecture.

You will be asked to read the assigned material via McGraw Hill's Book Smart System and answer some simple quiz questions. You are not expected to learn everything on the assignment but get familiar with the basic concepts outlined in the material. The pre-class quizzes are mostly consisting of the conceptual questions from your Dynamics textbook and some additional work problems. The questions are simple and designed to quiz your basic understanding of the material, which will be covered in the class. The quizzes will be posted on Canvas; you will work them within CANVAS.

You will also be assigned to watch in CANVAS some technical videos and answer the associated questions. All the videos will have embedded quizzes and these quizzes will be graded. Please note that if you skip a certain part of the video, you may also miss a question embedded in there. To obtain 100% grade for watching the videos, you must obtain 100% on the embedded quizzes. You can re-watch the videos and attempt the quiz again before submission.

Recommendation on How to Score High Grades on Pre-Class Quizzes:
1. Complete the Book Smart Assignment
2. Review the Book Smart material in your textbook one more time and rework the example problems without looking at the solution
3. Watch the video, if assigned
4. Complete the Pre class Quiz. Contact the tutor if you need any help with the quiz.
5. Make a list of questions to be asked when the class starts.

b. In-class Activities
The goal of the in-class activities is to answer any questions you might have from your pre-class assignments, discuss the complex concepts, and apply the theory by working on problems in small groups and with the help of the instructor. You will be assigned a group to work on a problem based on the concept covered that day in the class. You will submit an individual pdf copy of the solution for credit. (All the activities will be conducted on Zoom video).

3. Post Class Activities
Additional problems will be assigned from Connect to be worked individually after the class.

Course Schedule Spring 2022

(The weekly schedule is <u>tentative</u> and subject to change)

Homework will be assigned from the McGraw Hill Connect website. Access code must be purchased to use the website. All the homework assignments will be posted in CANVAS

Lectures: Week of	**Topic**	**Lecture #**
Jan 27	Introduction – Chapter11. 1: Kinematics of a Particle	1
Feb 1	Chapter 11. 2: Uniform Acceleration	2
	Chapter 11.2C: Interconnected particle Motion: Pulleys	3
Feb 8	Chapter 11.3: Graphical Solution	4
	Chapter 11.4: Motion of a Projectile	5
Feb 15	Chapter 11.5A: Tangential and Normal Components	6
	Chapter 11.5B: Radial and Transceivers Components	7
Feb 22	Chapter 12.1: Newton's Second Law of Motion	8
	Chapter 12.1: Newton's Second Law of Motion	9
March 8	Chapter 12.1: Newton's Second Law of Motion	10
	Chapter 12.2: Angular Momentum and Law of Gravity	11
March 15	Chapter 13.1: Work and Energy Methods	12
	Chapter 13.2: Power and Efficiency, Potential Energy	13
March 22	Chapter 13.2: Conservation of Energy Method	14
	Chapter 13.3: Impulse and Momentum Method	15
April 5	Chapter 13.3: Conservation of Momentum Method	16
	Chapter 13.4: Impact - Central	17
April 12	Chapter 13.4: Impact – Oblique	18
April 14	**Review**	
April 19	**Midterm Exam**	
April 21	Chapter 15.1: Kinematics of Rigid Bodies	19
April 26	Chapter 15.2: General Plane Motion	20
	Chapter 15.2: Relative Velocity	21
May 3	Chapter 15.3: Instantaneous Center of Rotation	22
	Chapter 15.4: Absolute and Relative Acceleration	23
May 5	Chapter 15.4: Acceleration	24
	Chapter 16.1: Kinetics of a Rigid Body, Translation	25
May 10	Chapter 16.1: Rigid Body Rotation	26
	Chapter 16.2: Moment of Inertia	27
May 12	Chapter 16.2: Kinetics: Rotation	28
Wednesday, May 25	**Final Exam: 10:30 AM – 12:15 PM**	

IMPORTANT NOTE: The Final Exam is common to all the sections and is scheduled for May 18, 2022. Please note that the exam date is on the <u>day of the Make Up Exam.</u>

You must plan your travel and other commitments accordingly. A make exam is allowed only for the university approved excuses. An "I" grade will be assigned to those who do not qualify for the approved excuses and are unable to take the exam as scheduled.

NOTE 1: You must satisfy the pre-requisites listed above. Submit a softcopy of the transcript for the courses at the 2nd class meeting that satisfy the requirement. Highlight the courses that are equivalent, and the grade obtained.

NOTE 2: **Extra Help**: You can make an appointment with the tutor for extra help. Here is the contact information:

Tutor
Raj Singh
Raj.singh@sjsu.edu
(408) 876-8406
By appointments only