IMPERIAL VALLEY COLLEGE

Basic Course Information

Semester:	**Sprint 2023**	Instructor Name:	**Octavio Ortiz**
Course Title & #:	**ENGR 212**	Email:	**octavio.ortiz@imperial.edu**
CRN #:	**20607**	Webpage (optional):	**Canvas**
Classroom:	**2722**	Office #:	**2767.1**
Class Dates:	**2/13 – 6/9**	Office Hours:	**Faculty Schedule**
Class Days:	**T/TR**	Office Phone #:	**760-355-5706**
Class Times:	**2:40 – 4:05 PM**	Emergency Contact:	**Silvia Murray**
Units:	**3**	Class Format:	**Face-to-Face (On Ground)**

Course Description

Kinetics of a particle; central force motion; systems of particles; work and energy; impulse and momentum; moments and products of inertia; Euler's equations of motion; vibration and time response; engineering applications. (CSU, UC)

Course Prerequisite(s) and/or Corequisite(s)

ENGR 210 with a grade of "C" or better, and credit or concurrent enrollment in MATH 194.

Student Learning Outcomes

Upon course completion, the successful student will have acquired new skills, knowledge, and or attitudes as demonstrated by being able to:

1. Solve problems involving kinetics of particles.
2. Solve problems involving kinematics of rigid bodies.
3. Solve problems involving plane motion of rigid bodies.
4. Demonstrate problem solving strategies by identifying an appropriate method to solve a given problem, correctly set up the problem, perform the appropriate analysis and computation, and share their interpretation of the conclusion or the outcome, using correct grammar or in an oral presentation.

Course Objectives

Upon satisfactory completion of the course, students will be able to:

1. Derive and apply the relationships between position, velocity, and acceleration of a particle in rectilinear and curvilinear motion.
2. Derive relations defining the velocity and acceleration of any particle on a rigid body for translation, rotation and general plane motion.
3. Apply the method of work and energy to engineering problems modeled as a single particle, a system of particles, or a rigid body in plane motion.
4. Apply the method of impulse and momentum to engineering problems modeled as a single particle, as system of particles, or a rigid body in plane motion.
5. Select the method of analysis that is best suited for the solution to a given problem. (Newton's Law, Work and Energy, Impulse and Momentum, or a combination of these methods).
6. Describe and analyze the plane motion of a particle relative to a rotating frame. Determine the Coriolis acceleration in plane motion.
7. Apply the principle of impulse and momentum to problems of direct and oblique central impact, as well as eccentric impact.
8. To effective communicate legible engineering solutions to be understood by engineers both in and out of their specific disciplines.

Textbooks & Other Resources or Links

Engineering Mechanics: Dynamics (w/out Mastering Access)
Author: Hibbeler
Edition: 14th
ISBN: 978-0133915389
Copyright Year: 2016
Publisher: Pearson Prentice Hall

Course Requirements and Instructional Methods

Students will be exposed to various instructional methods. In person lectures will introduce students to fundamental engineering concepts in Dynamics. Students will then apply what they learn in lectures to problems selected from the textbook.

Homework assignments will consist of an adequate number of applied problems selected from the textbook. Solving the homework problems will help students develop the problem solving and critical thinking skills that they will need for the chapter tests and the final exam.

The chapter tests will be focused on the content covered in a particular chapter(s). Questions will consists of multiple choice, true/false and short answer to assess conceptual and theoretical understanding. In addition, a few problems will be similar the ones on the lecture notes and the homework assignments. The final exam will be comprehensive.

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Course Grading Based on Course Objectives

ASSIGNMENT	POINTS
Homework Assignments	**10%**
Approximately 10-12 homework assignments	
Tests	**60%**
Four chapter tests (15% each)	
Final Exam	**30%**
Comprehensive final exam **6/8/23**	
Total	**100%**

Score	Letter Grade
≥ 90%	**A**
≥ 80%	**B**
≥ 70%	**C**
≥ 60%	**D**
< 60%	**F**

Course Policies

Attendance:

Students are expected to attend every class meeting. Lectures will preview homework assignments.

- Although attendance is not explicitly factored into your grade, failing to complete homework assignments and assessments due to absences will negatively impact your grade.
- Students with excessive absences will be dropped from the course as outlined in AP 5075.

Late Submissions:

Homework assignments are to be completed and submitted by the due date stated on Canvas. Late homework assignments will be accepted and penalized as follows:

- 70% maximum score if submitted within 24 hours of due date
- 50% maximum score if submitted 24 hours past the due date

Make-up Assignments:

There are no make-up assignments.

- Homework assignments that are more than a week past due will receive a score of 0 and cannot be made up.
- Tests and final exam cannot be made up, however, if the material is presented again in future assessments, then the failed assessment will be reevaluated.

Drop Policy

The instructor reserves the right to drop students who fail to attend the first-class session or fail to complete the first assignment by the assigned due date.

IVC Student Resources

IVC wants you to be successful in all aspects of your education. For help, resources, services, and an explanation of policies, visit http://www.imperial.edu/studentresources or click the heart icon in Canvas.

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Course Calendar

The semester calendar is meant to provide an overview of the topics that will be covered throughout the semester. Every effort will be made to adhere to the calendar; however, changes might be necessary.

Week	Date	Topic	Assignment
Week 1	2/14	• **Syllabus** • Chapter 12 – Kinematics of a Particle ○ Rectilinear kinematics: Continuous & Erratic Motion ○ Motion of a Projectile	
	2/16	• Chapter 12 – Kinematics of a Particle ○ Curvilinear Motion: Normal and Tangential Components	
Week 2	2/21	• Chapter 13 – Kinetics of a Particle: Force & Acceleration ○ Newton's Second Law of Motion ○ $\sum F = ma$ ○ Equation of Motion for a System of Particles	
	2/23	• Chapter 13 – Kinetics of a Particle: Force & Acceleration ○ Rectangular Coordinates ○ Equations of Motion: Normal and Tangential Coordinates	
Week 3	2/28	• **Review Chapters 12-13**	
	3/2	• **Test: Chapters 12-13**	
Week 4	3/7	• Chapter 14 – Kinetics of a Particle: Work and Energy ○ The Work of a Force ○ Principle of Work and Energy ○ Principle of Work and Energy for a System of Particles	
	3/9	• Chapter 14 – Kinetics of a Particle: Work and Energy ○ Power and Efficiency ○ Conservative Forces and Potential Energy ○ Conservation of Energy	
Week 5	3/14	• Chapter 15 – Kinetics of a Particle: Impulse and Momentum ○ Principle of Linear Impulse and Momentum ○ Principle of Linear Impulse and Momentum for a System of Particles ○ Conservation of Linear Momentum for a System of Particles	
	3/16	• Chapter 15 – Kinetics of a Particle: Impulse and Momentum ○ Angular Momentum ○ Relation Between Moment of a Force and Angular Momentum ○ Principle of Angular Impulse and Momentum ○ Steady Flow of a Fluid Stream	
Week 6	3/21	• **Review Chapters 14-15**	
	3/23	• **Test: Chapter 14-15**	
Week 7	3/28	• Chapter 16: Planar Kinematics of a Rigid Body	

Week	Date	Topic	Assignment
		○ Planar Rigid-Body Motion ○ Translation ○ Rotation about a Fixed Axis ○ Absolute Motion Analysis	
	3/30	• Chapter 16: Planar Kinematics of a Rigid Body ○ Relative-Motion Analysis: Velocity ○ Instantaneous Center of Zero Velocity ○ Relative-Motion Analysis: Acceleration ○ Relative-Motion Analysis using Rotating Axes	
Week 8	4/4	• Chapter 17 – Planar Kinematics of a Rigid Body: Force and Acceleration ○ Mass Moment of Inertia ○ Planar Kinetic Equations of Motion ○ Equations of Motion: Translation	
	4/6	• Chapter 17 – Planar Kinematics of a Rigid Body: Force and Acceleration ○ Equations of Motion: Rotation about a Fixed Axis ○ Equations of Motion: General Plane Motion	
Week 9	4/18	• **Review Chapters 16 – 17**	
	4/20	• **Test: Chapters 16 & 17**	
Week 10	4/25	• Chapter 18 – Planar Kinetics of a Rigid Body: Work and Energy ○ Kinetic Energy ○ The Work of a Force ○ The Work of a Couple Moment	
	4/27	• Chapter 18 – Planar Kinetics of a Rigid Body: Work and Energy ○ Principle of Work and Energy ○ Conservation of Energy	
Week 11	5/2	• Chapter 19 – Planar Kinetics of a Rigid Body: Impulse and Momentum ○ Linear and Angular Momentum ○ Principle of Impulse and Momentum	
	5/4	• Chapter 19 – Planar Kinetics of a Rigid Body: Impulse and Momentum ○ Conservation of Momentum	
Week 12	5/9	• **Review Chapters 18 - 19**	
	5/11	• **Test: Chapters 18 & 19**	
Week 13	5/16	• Chapter 20 – Three-Dimensional Kinematics of a Rigid Body ○ Rotation about a fixed point ○ General Motion	
	5/18	• Chapter 21 – Three-Dimensional Kinetics of a Rigid Body ○ Moments & Products of Inertia ○ Angular Momentum	

Week	Date	Topic	Assignment
Week 14	5/23	• Chapter 21 – Three-Dimensional Kinetics of a Rigid Body ○ Kinetic Energy	
	5/25	• Chapter 22 – Vibrations ○ Undamped Free Vibrations ○ Energy Methods	
Week 15	5/30	• Chapter 22 – Vibrations ○ Undamped Forced Vibrations	
	6/1	• Chapter 22 – Vibrations ○ Energy Methods ○ Undamped Forced Vibrations	
Week 16	6/6	• Review Chapters 12-22	
	6/8	• **Comprehensive Final Exam**	

*****Subject to change without prior notice*****