



SAINT LOUIS UNIVERSITY
MADRID

ESCI 2150 M01: Dynamics
Spring 2018

Class Days and Time: TR, 12:30-13:45

Classroom: PAH-24

Prerequisite(s): MATH-1510 Calculus I. Must enroll also in a PHYS-1620 lab section.

Credit(s): 3

Instructor: Francisco Prieto

Instructor's Email: francisco.prieto@slu.edu

Instructor's Campus Phone: 91 554 58 58, ext. 250

Office: PAH-203

Office Hours: M, 10:00-12:00

Course Description:

Particle kinematics and kinetics of a particle in rectangular, cylindrical and normal-tangential coordinates: projectile motion; relative motion using translating axes; work; conservative forces; conservation of energy; linear and angular impulse and momentum; conservation of momentum. Planar kinematics and kinetics of a rigid body: force, work-energy, and impulse-momentum.

Course Goals and Student Learning Outcomes:

The primary objective of this course is to introduce students to the concepts of dynamics. The students are expected to develop working skills in the dynamic analysis of both particles and rigid bodies. A special emphasis is placed on mechanical components, such as mechanisms, linkages, and gears.

At the end of the course, students will:

Engineering Program Objectives

- A. An ability to apply knowledge of mathematics, science, and engineering.
- B. An ability to design and conduct experiments, as well as to analyze and interpret data.
- C. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- D. An ability to function on multidisciplinary teams.
- E. An ability to identify, formulate, and solve engineering problems.
- F. An understanding of professional and ethical responsibility.
- G. An ability to communicate effectively.
- H. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- I. A recognition of the need for, and an ability to engage in life-long learning.
- J. A knowledge of contemporary issues.
- K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Student Learning Outcomes

Program Objectives	Student Learning Outcomes	Assessment Method
A	<p>A.1. Relate displacement, velocity and acceleration of a moving particle using kinematic relationships in both scalar and vector terms in any of the three different coordinate systems (x-y-z coordinates, normal-tangential coordinates, cylindrical coordinates).</p> <p>A.2. Apply the optimal method of solution, to solve problems on the motion of a particle, from Newton's Second Law, work-energy methods or impulse-momentum principles.</p> <p>A.3. Apply law of conservation of momentum to solve problems on collisions.</p> <p>A.4. Calculate the center of mass and the moment of inertia of a rigid body.</p> <p>A.5. Relate displacement, velocity and acceleration for the planar motion of a rigid body using a translating and rotating frame of reference.</p> <p>A.6. Formulate a solution to a problem on the general plane motion of a rigid body employing Newton's Second Law, work-energy methods or impulse-momentum principles.</p>	Mid-term and Final Exam
C	C.1. Analyze and design a mechanical system that meets desired specifications.	Project rubric
D	D.1. Work effectively in a team environment when working in a project.	Team-work rubric
E	<p>E.1. Represent graphically the problem of motion of a physical system using the free-body diagram technique.</p> <p>E.2. Identify the essential aspects of a problem, connect it to related areas of dynamics, formulate a strategy for solving the problem, apply appropriate techniques to arrive at a solution, test the correctness of the solution, and interpret the result.</p> <p>E.3. Show strong mathematical skills.</p>	Mid-term and Final Exam
G	<p>G.1. Communicate clearly and effectively the solution of a problem.</p> <p>G.2. Write a well-structured and clear project report.</p>	<p>Mid-term and Final Exam</p> <p>Project rubric</p>
K	K.1. Use Matlab to solve dynamics problems.	Project rubric

Saint Louis University - Madrid Campus is committed to excellent and innovative educational practices. In order to maintain quality academic offerings and to conform to relevant accreditation requirements, the Campus regularly assesses its teaching, services, and programs for evidence of student learning outcomes achievement. For this purpose anonymized representative examples of student work from all courses and programs is kept on file, such as assignments, papers, exams, portfolios, and results from student surveys, focus groups, and reflective exercises. *Thus, copies of student work for this course, including written assignments, in-class exercises, and exams may be kept on file for institutional research, assessment and accreditation purposes.* If students prefer that Saint Louis University - Madrid Campus does not keep their work on file, they need to communicate their decision in writing to the professor.

Required Texts and Materials:

R.C. Hibbeler, *Engineering Mechanics: Dynamics*, Prentice-Hall.

Other References:

F. P. Beer, E. R. Johnston, Jr., *Vector Mechanics for Engineers: Dynamics*, McGraw Hill (620.1 BEE)

Attendance Policy:

- **It is mandatory to attend all classes unless a reasonable excuse is given.** *Any unexcused absences in excess of 3 will result in a lowered grade and even in automatic failure in the course.*
- **Make up exams are not given.** Students who legitimately miss an exam, due to a doctor's visit or family emergency must provide written documentation of the circumstances. A letter from the university counselor is accepted. Exams that are missed illegitimately result in a score of F. Grades for these students will be based on the remaining exams. Missing more than one exam results in an F grade.
- Useful information of the course can be found in Blackboard: <https://myslu.slu.edu>

Course Requirements and Grading Rationale/System:

Grading system: The grade will be obtained from the following areas:

Homework and participation: **5 %**

Quiz: **10 %**

Project: **10 %**

First Mid-term Exam: **25 %**

Second Mid-term Exam: **25 %**

Final Exam: **25 %**

Grading Scales:

90% ≤ A ≤ 100%

87% ≤ A- < 90%

84% ≤ B+ < 87%

80% ≤ B < 84%

77% ≤ B- < 80%

74% ≤ C+ < 77%

70% ≤ C < 74%

66% ≤ C- < 69%

60% ≤ D < 66%

F < 60%

E-mail: Campus and course announcements will often be handled by e-mail. Students should check their "@slu.edu" e-mail regularly.

University Statement on Academic Integrity: Academic integrity is honest, truthful and responsible conduct in all academic endeavors. The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern.

The governing University-level Academic Integrity Policy can be accessed on the Provost's Office [website](#). Additionally, SLU-Madrid has posted its academic integrity policy online: <http://www.slu.edu/madrid/academics>. As a member of the University community, you are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions and appeals.

The professor will review these matters during the first weeks of the term. Please direct questions about any facet of academic integrity to your faculty, the chair of the department of your academic program, or the Academic Dean of the Madrid Campus.

University Title IX Statement: Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty

member must notify SLU's Title IX deputy coordinator, Marta Maruri, whose office is located on the ground floor of Padre Rubio Hall, Avenida del Valle, 28 (mmaruri@slu.edu; 915-54-5858, ext. 213) and share the basic fact of your experience with her. The Title IX deputy coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you wish to speak with a confidential source, you may contact the counselors at the SLU-Madrid's Counseling Services on the third floor of San Ignacio Hall (counselingcenter-madrid@slu.edu; 915-54-5858, ext. 230) or Sineus Multiplettherapy Institute, the off-campus provider of counseling services for SLU-Madrid (www.sineus.es; 917-00-1979). To view SLU-Madrid's sexual misconduct policy and for resources, please visit the following web address: <http://www.slu.edu/Documents/Madrid/campus-life/SLUMadridSexualMisconductPolicy.pdf>.

Students with Special Needs: In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Academic Dean's Office (San Ignacio Hall) or by going to <https://www.slu.edu/madrid/academics/student-resources>.

Students with a documented disability who wish to request academic accommodations must contact Disability Services to discuss accommodation requests and eligibility requirements. Once successfully registered, the student also must notify the course instructor that they wish to access accommodations in the course. Please contact Disability Services at disabilityservices-madrid@slu.edu or +915 54 58 58, ext. 230 for an appointment. Confidentiality will be observed in all inquiries. Once approved, information about the student's eligibility for academic accommodations will be shared with course instructors via email from Disability Services. For more information about academic accommodations, see "Student Resources" on the SLU-Madrid webpage.

Note: Students who do not have a documented disability but who think they may have one are encouraged to contact Disability Services.

Spring 2018 Course Schedule:

Class date	Topic
Jan. 11	Presentation. Kinematics of a Particle
Jan. 16	Kinematics of a Particle
Jan. 18	Kinematics of a Particle
Jan. 21	Last Day to Drop a Class without a Grade W and/or Add a Class; Last Day to Choose Audit (AU) or Pass/No Pass (P/NP) Options
Jan. 23	<i>Problems</i>
Jan. 25	Kinetics of a Particle: Force
Jan. 30	Kinetics of a Particle: Force
Feb. 1	<i>Problems</i>
Feb. 6	Kinetics of a Particle: Energy
Feb. 8	Kinetics of a Particle: Momentum
Feb. 13	<i>Problems</i>
Feb. 14	Registration for Summer 2018 Begins
Feb. 15	<i>Review</i>
Feb. 20	First Mid Term Exam
Feb. 22	Holiday
Feb. 27	Planar Kinematics of a Rigid Body
Feb. 27	Professors' Deadline to Submit Midterm Grades
March 1	Planar Kinematics of a Rigid Body
March 6	Planar Kinematics of a Rigid Body
March 8	<i>Problems</i>
March 9	Last Day to Drop a Class and Receive a Grade of W
March 13	Planar Kinetics of a Rigid Body: Force
March 15	Planar Kinetics of a Rigid Body: Force
March 15	Last Day to Submit Transfer Application for Fall Semester
March 20	<i>Problems</i>
March 22	<i>Problems</i>
March 27	Holiday
March 29	Holiday
April 3	Second Mid Term Exam
April 4	Registration for Fall 2018 Semester Begins
April 5	Planar Kinetics of a Rigid Body: Energy
April 10	Planar Kinetics of a Rigid Body: Energy. <i>Problems</i>
April 12	<i>Problems</i>
April 17	Planar Kinetics of a Rigid Body: Impulse
April 19	<i>Problems</i>
April 24	Planar Kinetics of a Rigid Body: Impulse
April 26	<i>Problems</i>
May 1	Holiday
May 3	Review
May 10	Final Exam (12:00 – 15:00)

May 11	University Housing Move-out Date
May 12	Commencement
May 13	Professors' deadline to submit spring 2018 final grades

Final Exam Schedules Spring 2018

	4 May (Fr)	7 May (Mn)	8 May (Tu)	9 May (Wd)	10 May (Th)
08:30-11:30	Mn classes that meet at 9:00 & 9:30	Mn classes that meet at 10:00	Mn classes that meet at 11:00 & 11:30	Tu classes that meet at 9:30	Tu classes that meet at 8:00
12:00-15:00	Tu classes that meet at 11:00	Mn classes that meet at 13:00	Tu classes that meet at 14:30	Mn classes that meet at 12:00 & 12:30	Tu classes that meet at 12:30
15:30-18:30	Mn classes that meet at 14:30	Tu classes that meet at 17:00 & 17:30	Mn classes that meet at 16:00	Tu classes that meet at 16:00	Mn classes that meet at 17:30
19:00-22:00	---	---	Mn classes that meet at 18:30 & 19:00	Tu classes that meet at 19:00	---