

Course Syllabus

Mechanics of Solids - ESCI 3100 M01

Spring 2018

General information

Course Reference Number	21857
Course Credits	3
Prerequisites	ESCI 2100 and MATH 2530/244
Class	17:30 - 18:45, MON & WED – Padre Rubio Hall 5
Add/Drop period	Last day to Drop w/o W or Add: January 21 st Last day to Drop w/ W: March 9 th

Instructor information

Name	Javier Oliva Quecedo, Ph.D. Civil Engineering
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Office location	1 st Floor Padre Arrupe Hall
Office hours	18:45 – 19:45, MON (*)

(*) You can also contact me via e-mail to solve questions.

Javier lectures at SLU-Madrid since 2014, prior to that he taught at UPM (Universidad Politécnica de Madrid) for five years. Besides teaching he works as a project engineer in a private company specialized in the design of bridges and structures.

Textbook

Mechanics of Materials (9th Edition), Russell C. Hibbeler, Pearson.

The course is taught without making reference to the book. There are some copies in the library in case the student needs the book as a reference.

E-mail

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

Course Description and Objectives

The study of Solid Mechanics, which is important to most engineering disciplines, deals with the action of forces on solids. It helps us to determine the load that a certain structure can withstand or to analyze its behavior under those forces. Every body that is subjected to a load is actually a structure and therefore it is easy to realize that this course is essential for the analysis and design of bridges, buildings, cars, planes, engines, silos, tanks or pipes. But Mechanics of Solids is not only applied to devices created by the human being, it is also useful to study the behaviour of human tissues, for example arteries, bones or ligaments.

The main goals of the course are to introduce to the students the basic principles of internal forces and stresses, deformations and strains of elastic bodies due to axial, torsional and flexural actions, the fundamentals of beam theory and its applications, buckling of columns, and the principles of member failure and design. The student will learn to understand the structural behaviour of most structures, to assess internal forces in different systems and to evaluate the stress level on their elements. The student will learn to determine the structural displacements and rotations due to external loads. Design procedures for structural and mechanical systems will be addressed as well; therefore the student will be capable of making smart decisions in analysis and design.

Course Outline

1. Stress
2. Strain
3. Mechanical Properties of Materials
4. Axial Load
5. Torsion
6. Bending
7. Shear in Beams
8. Design of Beams
9. Deflections of Beams
10. Stress Transformation
11. Buckling of Columns

Note that the course schedule may be subject to change depending on the class progress.

Homework

Sets of homework will be handed out for every unit. Homework exercises are intended to help the student to understand the material. That is why it is important that you do this work independently. There is typically a strong correlation between effort on the homework and exam scores.

You will grade your homework on a completion/effort basis. You will receive full credit for attempting to complete each problem regardless of whether your answers are correct. To receive credit for a problem you must show all necessary diagrams, equations and steps. **Homework Guidelines** have to be observed in every submittal.

Homework is expected to be handed in on time. Late submissions will be penalized with a 10 % grade reduction if handed in the first class after the deadline. Solutions will be provided for you to check your work.

Voluntary Project

Build a device to:

- Visualize the structural behavior of a given system and/or
- Demonstrate a Mechanics of Solids' principle and/or

- Demonstrate a structural principle.

The principle may or not be covered in this course. You can choose any one that you find interesting. You can find inspiration wherever: real world, books, the internet...

Exams

There will be one midterm exam (Units 1 to 5) and a comprehensive final exam covering the full content of the course:

- **Midterm Exam:** Wednesday, February 21st 2018 (Class hour).
- **Final Exam:** Thursday, May 10th 2018 (**15:30 – 18:30**). According to SLU-Madrid Final Exam Schedule (see table below taken from SLU-Madrid website).

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	---

Grading System

The grade will be obtained from the following areas:

Homework	10 %
Mid-term exam	40 %
Final exam	50 %
Voluntary project	Up to 18 % extra

Grading scale will be as follows:

A	> 90 %	A-	87-89 %	B+	84-86 %	B	80-83 %
B-	77-79 %	C+	74-76 %	C	70-73 %	C-	66-69 %
D	60-65 %	F	< 60 %				

Course Policies

1. Students are encouraged to participate in class discussions and to ask questions at any moment in order to improve the understanding of explanations.
2. Announcements may be made during the semester.
3. Students are expected to be on time unless a reasonable excuse is given.

4. Students are expected 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.
5. The use of laptops and mobile devices is not allowed in class.
6. Useful information for the course may be found on the SLU web.
7. Syllabus, reading and homework problems are subject to change.
8. Students are responsible for all lecture material, handouts, homework and assigned reading.
9. 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.

Engineering Program Learning Outcomes (PLOs)

- (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 in this course (SLOs)

PLOs	Student Learning Outcomes	Assessment Method
A	A.1. Know how to assess internal forces in different structural systems A.2. Evaluate the stress level in different elements of those systems A.3. Determine the safety of structural elements A.4. Determine structural displacements due to external loads	<ul style="list-style-type: none"> • Midterm and Final Exam • Homework • Detailed analysis of work • Classroom observations
C	C.1. Learn basic concepts for designing structures to be efficient, safe and pleasant using minimal resources	<ul style="list-style-type: none"> • Midterm and Final Exam • Homework • Detailed analysis of work • Classroom observations
E	E.1. Be able to understand design procedures for structural elements E.2. Be capable of making smart decisions in structural design	<ul style="list-style-type: none"> • Midterm and Final Exam • Homework • Detailed analysis of work

	E.3. Understand the structural behavior of most structures	• Classroom observations
F	F.1. Learn why a good understanding of the structural concepts is important for a professional and ethical work	• Not directly assessed
J	J.1. Discussing contemporary structural and mechanical systems	• Not directly assessed
K	K.1. All the concepts learnt in this course are used in modern engineering	• Not directly assessed

Academic Honesty and Plagiarism

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 at

https://www.slu.edu/Documents/provost/academic_affairs/University-wide%20Academic%20Integrity%20Policy%20FINAL%20%2006-26-15.pdf.

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 policies during the first weeks of the term: please direct questions about any facet of academic integrity to your professor, the chair of the department of your academic program or the Academic Dean of the Madrid Campus.

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 <http://www.slu.edu/madrid/learning-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 to Disability Services.

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 Sinews Multipletherapy Institute, the off-campus provider of counseling services for SLU-Madrid (www.sinews.es; 91-700-1979). 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>

Collection of student work for assessment

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.