

COURSE SYLLABUS

1. General Information:

Alpha-numeric codification: INGE 4019

Course Title: Introduction to Mechanics of Material for Mechanical Engineers

Number of credits: 4

Contact Period: 4 contact hours of Conference a week

2. Course Description:

English: Stresses and strains due to axial, torsional, and flexural loads; shear and moment diagrams; stress and strains transformations; stresses due to combined loadings.

Spanish: Esfuerzos y deformaciones debido a cargas axiales, de torsión y de flexión; diagramas de fuerza cortante y momento flector; transformación de esfuerzos y deformaciones; esfuerzos debido a cargas combinadas.

3. Pre/Co-requisites and other requirements:

INGE 3031, and MATE 3063

4. Course Objectives:

The course aims to:

- develop a thorough understanding and working knowledge of the relations between the loads applied to a nonrigid body and the stresses and deformations produced in the body.
- develop a clear insight into the relations between stress and strain for a wide variety of conditions and materials.

After completing the course, the student should be able to understand and apply the fundamental principles of mechanics to simple engineering problems.

5. Instructional Strategies:

- | | | | |
|---|--|--|-------------------------------------|
| <input checked="" type="checkbox"/> Conference | <input checked="" type="checkbox"/> Discussion | <input type="checkbox"/> Computation | <input type="checkbox"/> Laboratory |
| <input type="checkbox"/> Seminar with formal presentation | | <input type="checkbox"/> Seminar without formal presentation | |
| <input type="checkbox"/> Workshop | <input type="checkbox"/> Art workshop | <input type="checkbox"/> Practice | <input type="checkbox"/> Trip |
| <input type="checkbox"/> Thesis | <input type="checkbox"/> Special problems | <input type="checkbox"/> Tutoring | <input type="checkbox"/> Research |
| <input type="checkbox"/> Other, please specify: | | | |

6. Minimum or Required Resources Available:

Textbook, Laptop with camera, access to High Speed Internet.

7. Course time frame and thematic outline:

Outline of Topics	Contact Hours
Introduction; Static Review	2
Normal Stress and Strain, Shear Stress and Strain	5
Allowable Stresses and Allowable Loads, Safety Factors, Probabilistic Loads. Mechanical Properties of Materials Stress-Strain behavior, Hooke's Law, Poisson's ratio	3
Axially Loaded Members – Stress and Strain Analysis, Changes in Length of Axially Loaded Members, changes in dimensions	3
Statically Indeterminate Elements; Thermal Stresses, Stress Concentrations for Axial Loads	4
Shear Force and Bending-Moment Diagrams. Relationships Between Loads, Shear Forces, and Bending Moments. Bending Deformation of a Straight member, Flexure Formula, Stress Concentrations for Bending	8
Transverse Shear in Straight Members. The Shear Formula. Deflection of Beams and Shafts	5
Torsion of Circular Shafts, Torsion Formula, Transmission of Power. Angle of Twist, Strain in Pure Shear and Relationship Between Moduli of Elasticity E and G. Statically Indeterminate Torque-Loaded Members. Torsion of Noncircular Prismatic Shafts, Stress Concentrations in Torsion	13
Thin-Walled Pressure Vessels, Combined Loadings, Unsymmetric Bending	4
Plane Stress Transformation, Principal and Maximum In-Plane Shear Stresses. Mohr's Circle for Plane Stress, Triaxial Stresses. Material-Property Relationships: Hooke's Law. Failure of Materials.	10
Partial Exams	3
Total hours: (equivalent to contact period)	60

8. Grading System:

Quantifiable (letters)

Not Quantifiable

9. Evaluation Strategies:

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2 to 4	40 to 80
<input checked="" type="checkbox"/> Final Exam	1	20 to 30
<input checked="" type="checkbox"/> Short Quizzes	Variable	0 to 10
<input checked="" type="checkbox"/> Oral Reports	Variable	0 to 10
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	Variable	0 to 10
<input type="checkbox"/> Journals		
<input type="checkbox"/> Other, specify:		
TOTAL:		100%

10. Bibliography:

Textbook:

- Mechanics of Materials, F.P. Beer, E.R. Johnston, and J.T. Dewolf, McGraw-Hill, Inc., 8th ed., 2020.

Additional References

- Mechanics of Materials, James M. Gere, Barry Goodno, CL Engineering R.C., 8th ed. 2012
- Mechanics of Materials, Hibbeler, R.C, Pearson Prentice Hall, 10th ed., 2015
- Mechanics of Materials, A. Bedford and K. M. Liechti , 1st ed., Prentice-Hall, Inc., 2000.
- Mechanics of Materials, A. Pytel and J. Kiusalaas, Brooks/Cole Thomson Learning, Inc., 1st ed., 2002

11. Reasonable Accommodation (Law 51):

The University of Puerto Rico at Mayagüez (RUM) recognizes that each student has an inherited right to request reasonable accommodation according to Law 51: Law for Integral Educational Services for People with Disabilities. Every student has the right to receive reasonable accommodation if he/she presents the necessary evidence to be evaluated by the Office of Services to Students with Disabilities (OSEI-RUM), and the related information can be found at the following link: <https://www.uprm.edu/cms/index.php/page/85>. If your case is approved by OSEI-RUM, you will receive reasonable accommodation in your courses and evaluation, and you must contact each professor for course registered. For additional information contact OSEI-RUM at Sánchez Hidalgo 410 or via telephone 787-832-4040 extension 3107.

12. Academic Integrity:

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws.—

13. Policy Against Discrimination Based on Sex, Sexual Orientation, and Gender Identity:

The University of Puerto Rico prohibits discrimination based on sex, sexual orientation, and gender identity in any of its forms, including that of sexual harassment. According to the Institutional Policy Against Sexual Harassment at the University of Puerto Rico, Certification Num. 130, 2014-2015 from the Board of Governors, any student subjected to acts constituting sexual harassment, may turn to the Office of the Student Ombudsperson, the Office of the Dean of Students, and/or the Coordinator of the Office of Compliance with Title IX for an orientation and/or formal complaint.

14. Sexual Harassment: Certification 130-2014-2015 states:

Sexual harassment in the workplace and in the study environment is an illegal and discriminatory act and is against the best interests of the University of Puerto Rico. All persons who understand they have been subject to acts of sexual harassment at the University of Puerto Rico may file a complaint and request that the institution investigate, where necessary, and assume the corresponding action by the university authorities. If the complainant is a student, he or she must refer his or her complaint to the Office of the Student Ombudsperson or that of the Dean of Students.

15. Certification 06-43 of the Academic Senate states, "The academic guidelines for offering online courses," defines:

Traditional face-to-face courses are those that have less than 25% of the course's regular contact hours via the Internet. Therefore, a three-credit course will be considered "face to face" if, of the 45 hours of regular contact, 11 or less are taught via the Internet. According to certification 16-43 of the Academic Senate, a course may include up to 25% of its total contact hours via the Internet. The objective of this is so that all professors have this alternative in the case of any unscheduled eventuality.

Revised by:

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Approved by:

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