Strength of Materials
2019- 2020

Academic Year

MODULE	AREA	YEAR	SEMESTER	ECTS CREDITS	COURSE
Common Industrial	Strength of Materials	2nd	3rd	6	Compulsory

LECTURER	ADDRESS
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	TUTORIAL ASSISTANCE
	Consult: http://meih.ugr.es/pages/mecanica Tutoring is also available in native Swedish by Guillermo Rus Carlborg

GRADE	OTHER MASTER
Degreee of Industrial Electronics Engineering	

RECOMMENDATIONS

To have passed:
- Maths I
- Maths II
- Physics I

BRIEF DESCRIPTION OF CONTENTS

Knowledge and use of principles of strength of materials.
Lab tests about mechanics properties of materials.

Deformations and stress of objects under external loadings
To calculate stresses in isostatic structures.
To calculate displacements in isostatic and hyperstatic structures. Energy Methods.
Analysis plane of stress and strain. Applications.

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[1]   * Consulte posible actualización en Acceso Identificado > Aplicaciones > Ordenación Docente.

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INFORMACIÓN SOBRE TITULACIONES DE LA UGR
http://grados.ugr.es

GOALS

The student should be able:
- To know the main characteristics of strength of materials.
- To recognize different stress: axial, transverse and torsional.
- To calculate stress and deformations.
- To calculate movements in isostatic and hyperstatic structures.
- To study the principle of virtual work in strength of materials.
- To know the process of buckling and solve main cases.
- To study plane stress and calculate structures with loadings of pressure, pipes and beams.

SYLLABUS

Unit 1	Introduction
1.1.	Solid deformation, mechanical prism and main principles of strength of materials.
1.2.	Loadings. Equilibrium.
1.3.	Tension and deformation.
1.4.	Stresses and internal equilibrium.

Tema 2	Compression and tesnsile stress
2.1	Introduction.
2.2	Tensions due to axial stresses.
2.3	Deformations due to axial stresses.

Tema 3	Torsional stress
3.1.	Introduction.
3.2.	Shear tensión, angular deformation and Hooke's law.
3.3.	Deformation due to torsional stress.
3.4.	Shear tensión due to torsional stress.

Tema 4	Bending stress
4.1.	Deformation due to bending stress.
4.2.	Deflection Equation.

Tema 5	Movimientos
5.1.	Introduction.
5.2.	Deflection equation.
5.3.	Hyperstatic systems.

Tema 6	Transversal stress
6.1.	Introduction
6.2.	Tranversal stress with flexural stress.
6.3.	Center of shear.

Tema 7	Principle of virtial work.
7.1.	Statement.
7.2.	Demonstration.
7.3.	How to use the principle of Virtual Work to calculate stresses and deformations.

Tema 8	Buckling

8.1.	Introduciton
8.2.	Simplified model.
8.3.	Buckling in an elastic column.

Tema 9	Plane Stress
9.1.	Introduction.
9.2.	Principal stress and maximun shear tensions.
9.3.	Mohr circles.

REFERENCES

- Resistencia de Materiales para Ingeniería Electrónica. Lucía Comino, Guillermo Rus, Juan Melchor, Ed. Godel, 2015.
- Resistencia de Materiales. Ortiz Berrocal. 3ª Ed. Mc Graw Hill.
- Mecanica de Materiales. Gere-Timoshenko. 2ª Ed. Grupo Editorial Iberoamericana.
- Mecánica de Materiales. Ferdinand P. Beer, E. Russell Johnston Jr., John T. Dewolf, David F. Mazurek.
- Introduccion a la Mecanica de Solidos. Popov. Ed. Limusa.
- Mecánica Vectorial Para Ingenieros: Estática. Beer-Johnston. Mc Graw Hill
- Resistencia de Materiales. Feodosiev. Ed. Mir, Moscú.
- Resistencia de Materiales. Stiopin. Ed. Mir, Moscú.
- Problemas de Resistencia de Materiales. Miroliubov y Otros. Ed. Mir, Moscú.
- Problemas de Resistencia de Materiales. Rodríguez Avial. Ed. Dossat.
- Resistencia de Materiales. Nash. Serie de Compendios Schaum. Mc Graw-Hill.

LINKS

www.ugr.es/~grus

METHODOLOGY

The teaching of the subject will be theoretical and practical with:

1. **Theretical lessons**: Lessons where teachers will explain main ideas with necessary support.

2. **Lessons where teacher will solve problems.** The student will be able to know how to apply theorical contents.

3. **Problems Lessons:** Lessons where students will solve problems to well understand the subject. Problems will be explained in class by students (individually or grup work).

4. **Lab works:** Students will work in groups. Teacher will explain what students should do to contrast experiments real results.

5. **Projects:** Project-Based learning is a method which consist of students learn by themselves. There are some question/problems that students should solve doing some research. This work consists of in three work in class and a group work for homework, in this homework they should design an structure (a crane, a tank, a bridge,...) which have been built (a real structure). The main idea is to recalculate and analyze how can fail. Secondly, they

should decide how to improve it the Project. In addition they should explain to the class the work they have done.

6. **Study and work by yourself**
   Teacher explain in class main ideas and send some question to think about it at home. With these activities the student will be able to acquire knowledge about the strength of materials.

7. **Tutoring**
   It improves interaction between students and teachers. Goal is to review students works and help them to finish it successful.

The assessment is a continued system with:
- Classes
- Homework
- Exams

If you the student wants to do the final exams, he has to request so in the two first weeks of course, explaining the reason to not follow the continued assessment.

EVALUACIÓN (INSTRUMENTOS DE EVALUACIÓN, CRITERIOS DE EVALUACIÓN Y PORCENTAJE SOBRE LA CALIFICACIÓN FINAL, ETC.)

- Exam/Questions theorical-practical (75%). Final exams.
- Lab work (10%).
- Project-Based learning (15%).
- Personalize mark: thecher deserves to make changes on qualifications depending on the participation of student in class.
- In case of extraordinary exams there will not be personalize mark only theorical-practical exam.
- In case of final exams, the date of that exam will be decided by the study Center.

ADITIONAL INFORMATION

All the information is available on PRADO.