Universidad Zaragoza

Year : 2019/20

28918 - Strength of materials and structural analysis

Syllabus Information

Academic Year: 2019/20
Subject: 28918 - Strength of materials and structural analysis
Faculty / School: 201 - Escuela Politécnica Superior
Degree: 437 - Degree in Rural and Agri-Food Engineering
583 - Degree in Rural and Agri-Food Engineering
ECTS: 6.0
Year: 2
Semester: Second semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as:

- Lectures,
- Problem-solving Sessions,
- Computer lab sessions and
- Practical sessions.

4.2.Learning tasks

The course includes the following learning tasks:

- Lectures. The teacher explains the theoretical content of each session. One of the objectives of this activity will be the promoting of the participation of the students and cooperative learning.
- Problem-solving sessions. Students, working individually or in groups, gain knowledge and skills by working to respond to problems and questions. A report of the problems resolved by students will be required.
- Computer lab sessions. Students use specific structural calculation software.

- Practical sessions. Students, working in groups, gain knowledge about the testing of materials and the analysis of deformations of structural elements under different load cases.

4.3.Syllabus

The course will address the following topics:

Theory

SECTION 0. PRESENTATION OF THE SUBJECT

0. Presentation, methodology and system of evaluation.

SECTION 1. INTRODUCTION TO MATERIAL STRENGTHS AND CALCULATION OF STRUCTURES

1.Basic concepts of statics

SECTION 2. MATERIAL STRENGTHS

2. Simple traction and compression below the elastic limit.

3. Coplanar tensions. Principal tensions.

4. Bending: cutting forces (V) and bending moments (M)

5. Bending: normal tensions due to bending moment

6. Bending: cutting tensions due to the cutting force V

7. Bending: deformations caused by the bending moment

8. Bending: static indetermination in bending. Continuous beams

9. Diverted bending and compound bending

10. Flexo-compression or bulging

11. Torsion and combined forces.

SECTION 3. CALCULATION OF STRUCTURES OF BARS

12. Methods of calculation for articulated plane systems. Trusses.

13. Methods of calculating statically indeterminate bar structures

Practicals

PRACTICAL 1. DEFORMATION IN BEAMS BY SIMPLE BENDING

a) Deformation in bi-supported beams, beams of two materials.

b) Deformation in supported/ built-in beams, beams of two materials.

c) Deformation in built-in beams, beams of two materials.

PRACTICAL 2. DEFORMATION IN DEMAND BEAMS BY DIVERTED BENDING

a) Deformation in a beam built into a ledge

PRACTICAL 3. DEFORMATION IN PLANE PORTICOS

Arrow in the middle of a girder and rotation on the head of a bi-supported portico, situations of point load in the middle of a girder and horizontal point load on the head of the pillar.

Arrow in the middle of a girder and rotation on the head of a built-in portico, situations of point load in the middle of a girder and horizontal point load on the head of the pillar.

4.4.Course planning and calendar

Type of activity/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Onsite activity																	
Theory	2	2	2	2	2	2	2	2		2		2	2	2	2	2	
Problems	2	2	2	2	2	2	2	2									
Laboratory sessions										2		2	2	2	2	2	
Group work																	
Fieldwork																	
Tutorials ECTS																	

Evaluation																	
Off-site actovity																	
Autonomous work	4	4	4	4	4	4	4	4	7	4	7	4	2	2	4	4	7
Group work													3	2			
TOTAL	8	8	8	8	8	8	8	8	7	8	7	8	9	8	8	8	7

4.5.Bibliography and recommended resources

BB Riley, William F.. Ingeniería mecánica : estática / William F. Riley, Leroy D. Sturges Barcelona [etc.] : Reverté, cop.1995

BB Rodríguez-Avial Azcunaga, Fernando. Problemas resueltos de resistencia de materiales / Fernando Rodríguez-Avial Azcunaga . - 3a. ed. Madrid : Libreria Editorial Bellisco, 1989

BB Vázquez Fernández, Manuel. Resistencia de materiales / Manuel Vázquez . - 3a. ed. Madrid : Noela, 1994

BC Garrido Garcia, José Antonio. Resistencia de materiales / José A. Garrido García, Antonio Foces Mediavilla Valladolid : Secretariado de Publicaciones, Universidad de valladolid, 1994

BC Hibbeler, Russell C.. Statics and mechanics of materials / R.C. Hibbeler . New York : Macmillan Publishing Company; Toronto : Collier Macmillan Canada ; New York [etc.] : Maxwell Macmillan International, cop. 1993 [english friendly]

BC Mecánica vectorial para ingenieros. Estática / Ferdinand P. Beer ... [et al.] ; revisión técnica, Javier León Cárdenas, Hidalgo Cavazos . 9ª ed. México D. F. : McGraw-Hill/Interamericana, cop. 2010

BC Ortíz Berrocal, Luis. Resistencia de materiales / Luis Ortíz Berrocal . 2a ed. Madrid [etc.] : McGraw-Hill, D.L. 2002

BC Rodriguez-Avial Azcunaga, Fernando. Resistencia de materiales / Fernando Rodriguez-Avial Azcunaga . - 4a. ed. Madrid : Bellisco, 1990

BC Timoshenko, Stephen P.. Resistencia de materiales. Parte 1, Teoría elemental y problemas / S. Timoshenko . - 16a. ed Madrid : Espasa-Calpe, 1989

The updated recommended bibliography can be consulted in:
http://psfunizar7.unizar.es/br13/egAsignaturas.php?codigo=28918&Identificador=13144