Universitat de Lleida

DEGREE CURRICULUM

ELASTICITY AND STRENGTH OF MATERIALS I

Coordination: BRADINERAS ESCO, FRANCISCO JAVIER

Academic year 2017-18

Subject's general information

Subject name	ELASTICITY AND STRENGTH OF MATERIALS I
Code	102305
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION
Typology	(see table below)

Degree	Course	Typology	Modality
Bachelor's Degree in Mechanical Engineering	2	COMPULSORY	Attendance-based
Master's Degree in Industrial Engineering	1	COMPLEMENTARY TRAINING	Attendance-based

ECTS credits	6
Groups	1GG,2GM
Theoretical credits	2
Practical credits	4
Coordination	BRADINERAS ESCO, FRANCISCO JAVIER
Department	ENGINYERIA AGROFORESTAL
Teaching load distribution between lectures and independent student work	60h attendance class + 90h personal work
Important information on data processing	Consult this link for more information.
Language	Spanish

ELASTICITY AND STRENGTH OF MATERIALS I 2017-18

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
BRADINERAS ESCO, FRANCISCO JAVIER	bradi@eagrof.udl.cat	9	Monday 9:30-10:30

Subject's extra information

We recommend attendance and resolution of proposed problems.

Case studies should be resolved as soon as possible, it is not advisable to leave them to the last minute.

Consulting bibliography is an essential requirement for the subject.

Students must achieve a level of knowledge that allows the calculation of structural and mechanical parts to achieve capacity enough to select the most appropriate design criteria for optimum performance of each piece.

It aims to establish a foundation of calculation knowledge that will be needed in other areas such as in the case of structural design, mechanical, etc.

Learning objectives

- Apply energy theorems in structural calculation.

- Calculate isostatic pinned structures.

- Calculate hyperstatic pinned structures.

- Get inner forces in pinned with pillar structures.

- Working with elastic solids and get its stress in a analytical and graphical way.

- Obtain deformations in elastic solids and relate them with stress.

Competences

Degree-specific competences

- Knowledge and ability to apply the principles of elasticity and resistance of materials to the behaviour of real solids.

  Goals

  - Students must be able to address real problems and propose simplifications to them, within the field of strength of materials

- Knowledge and ability for calculus, structural design and industrial constructions.

  Goals

  - Students must be able to calculate a structure and decide what kind of links are the best to the design system selected

Degree-transversal competences

- Ability to gather and interpret relevant data in their field of study, and to emit judgements that include a reflection on relevant themes of a social, scientific or ethical nature

  Goals

  - Students must be able to comprehend data of problems and results

- Ability to resolve problems and elaborate and defend arguments inside their field of study

  Goals

  - The student must learn to propose and decide the order to follow for solving problems and real cases

- Ability to analyse and synthesize.

  Goals

  - Students must be able to organize the results of the calculations and choose the relevant ones
  -

Subject contents

0. - Strength of materials. Introduction.

  - Supports and loads

  - Degree of hyperstatism.

  - Internal forces.

1.-Systems of pinned bars.

- Isostatic.

- Statically indeterminate.

- Mixed Systems with embedded pillars.

2. - The mechanic prism. Tensions.

- Intrinsical components

- Equations of equilibrium

- Principal stresses

- Stress Ellipsoid

- Mohr Circles

3. - The mechanic prism. Deformations.

- Matrix of deformations

- Changes in volume

- Intrinsical components

- Principal deformations

- Angular variation

- Strain Ellipsoid

- Mohr Circles

- Terms of compatibility

4. - Relationship between stress and strain.

- Stress-strain diagrams

- Material properties

- Transverse deformations

- Generalized Hooke's Law

- Lame Equations

5. - Theory of the inner potential.

- Work for external and internal forces

- Coefficient of influence

- Elastic energy

- Energy theorems

- Criteria for resistance. Equivalent stress

Methodology

* Lectures: Before beginning with the problems a theoretical introduction to each chapter of the course will take place.

* Problems: The main focus of the course is to learn to solve problems of strength of materials and structural design. After the theoretical introduction will arise and solve different kind of problems. Problems are conducted in

small groups.

* Exercises to deliver: Students also have to solve problems individually or in groups. The problems solved and delivered in class will be used in the calculation of the final mark for the subject. These exercises will be conducted in small groups.

* Case Studies: At the end of each chapter, a case studie will be required. Students will submit a final report with all of them. This case is different for each student as data depends on the student identification number. This report will also have an important weight in the mark of the subject.

Development plan

Week	Chapters	Classroom working hours	Freelance working hours
1-2	Chapter 0	8	12
3-5	Chapter 1, Isostatic and statically indeterminate	12	18
6-7	Chapter 1, Mixed systems with pillars	8	12
8 y 10	Chapter 2	8	12
11-12	Chapter 3	8	12
13-14	Chapter 4	8	12
15	Chapter 5	4	6

Evaluation

Exams: 80% (2 partial 40%)

Case Studies: 20% (Report and class exercises)

Bibliography

* ORTIZ BERROCAL. Resistencia de Materiales. Mc Graw Hill

* ORTIZ BERROCAL. Elasticidad. McGraw Hill.

* RODRIGUEZ-AVIAL. Resistencia de Materiales. ETSII Madrid.

* TIMOSHENKO. Resistencia de Materiales. Thomson

* M.VAZQUEZ. Resistencia de Materiales. Ed. Noela.

* M.ROMERO,P.MUSEROS,M.MARTINEZ Resistencia de Materiales. Ed. Universitat Jaume I

* RAMÓN ARGÜELLES ÁLVAREZ. Cálculo de estructuras. E.T.S.I.M. MADRID.

* ENRIQUE NIETO. Estructuras arquitectónicas e industriales, su cálculo. ED. TEBAR.

* SANTIAGO RICO FERNANDO. Teoría y cálculo sobre estructuras resistentes de prismas rectos. BELLISCO

* MC CORMARC. Análisis de estructuras, método clásico y matricial. ALFAOMEGA