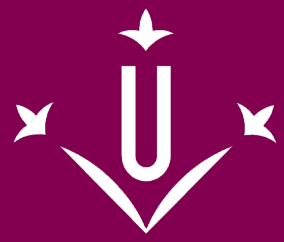

Universitat de Lleida

DEGREE CURRICULUM

# ELASTICITY AND STRENGTH OF MATERIALS I

Academic year 2015-16

## Subject's general information

| | |
|---|---|
| **Subject name** | Elasticity and Strength of Materials I |
| **Code** | 102305 |
| **Semester** | 2n Q Avaluació Continuada |
| **Typology** | Obligatòria |
| **ECTS credits** | 6 |
| **Theoretical credits** | 2 |
| **Practical credits** | 4 |
| **Department** | Enginyeria Agroforestal |
| **Modality** | Presencial |
| **Language** | Castellà |
| **Degree** | Degree in Engineering Mechanics |
| **E-mail addresses** | bradi@eagrof.udl.cat |

## Teaching staff

Francisco Javier Bradineras Esco

## Learning objectives

Students must achieve a level of knowledge that allows the calculation of structural parts and mechanical level to acquire enough capacity to select the most appropriate design criteria for optimum performance of each piece. It aims to establish a foundation of calculation that will be needed in other areas such as in the case of structural design, mechanical, etc.

See section skills.

## Significant 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

First partial:

0 - Introduction to strength of materials
1. - Pinned bar systems

Second partial:

2. - The mechanical prism. Stress
3. - The mechanical prism. Strain.
4. - Relationship stress - strain.
5. - Theory of inner potential.

## Development plan

Check regulations subject to the virtual campus.

## 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