Strength of Materials

Academic Year: (2020 / 2021) **Review date: 09-02-2021**

Department assigned to the subject: Continuum Mechanics and Structural Analysis Department

Coordinating teacher: ZAERA POLO, RAMON EULALIO

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Mechanics of Structures
Elasticity.

OBJECTIVES

By the end of this subject, students will be able to have:
1. a systematic understanding of the key aspects and concepts of strength of materials on the behavior of real solids.
2. coherent knowledge of mechanical engineering including some at the forefront of the branch in strength of materials.
3. the ability to apply their knowledge and understanding to identify, formulate and solve problems of strength of materials using established methods
4. the ability to select and apply relevant analytic and modelling methods in strength of materials .
5. the ability to apply their knowledge and understanding to develop and realise designs in strength of materials to meet defined and specified requirements;
6. an understanding of design methodologies in strength of materials , and an ability to use them.
7. the ability to design and conduct appropriate experiments of strength of materials , interpret the data and draw conclusions;
8. workshop and laboratory skills in strength of materials .
9. the ability to select and use appropriate equipment, tools and methods to solve problems of strength of materials ;
10. the ability to combine theory and practice to solve problems of strength of materials ;
11. an understanding of applicable techniques and methods in strength of materials , and of their limitations.

DESCRIPTION OF CONTENTS: PROGRAMME

1. PART 1: STRESSES IN PRISMATIC ELEMENTS
1.1. Normal stresses: axial force and bending moment
1.2. Shear stresses: shear force and torsion

PART 2: MOVEMENTS IN PRISMATIC ELEMENTS
2.1. Navier-Bresse equations
2.2. Mohr theorems
2.3. Equation of the Elastica

PART 3: ENERGETIC THEOREMS
3.1. Work of the extrenal forces
3.2. Elastic energy stored in the prismatic element
3.3. Maxwell-Betti theorem
3.4. First Castigliano theorem. Applications

PART 4: SOLVING STATICALLY INDETERMINATE STRUCTURES
4.1. Fundamentals of structural analysis
4.2. Beams
4.3. Truss structures
4.4. Frame structures

LEARNING ACTIVITIES AND METHODOLOGY

In each week one lecture session (master class) and one practical session (in reduced groups) will be taught. The first is geared to the acquisition of theoretical knowledge, and the second to the acquisition of practical skills related to theoretical concepts. In addition to this sessions two laboratory practical sessions in reduced groups (maximum 20 students) will be impart.
Students will have the possibility of individual tutorials.
Students will have the possibility of individual tutorials. Also, there could be group tutoring session.

ASSESSMENT SYSTEM

1. CONTINUOUS ASSESSMENT:
1.1. Laboratory practices.
Two laboratory practices will be carried out, delivering 1 evaluable report. In order to pass the course, the attendance and performance of the laboratory practices foreseen in the weekly planning are compulsory. The weighting of the practice note in the continuous evaluation corresponds to the established in the course, in accordance with the university regulations. In the course Strength of Materials, the weighting of the laboratory practices takes the value of 15% of the final mark.
1.2. Continuous assessment test.
A continuous assessment test will be carried out during the course, with a total weight of 25% of the final mark.

2. FINAL GRADE OF THE COURSE:
A final exam will be taken with a weight of 60% on the final grade. Likewise, in order for the continuous evaluation mark to be taken into account in the final grade of the course, it will be necessary to obtain a minimum grade of 4.5 (over 10) in the final exam.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- F.P. Beer, E.R. Johnston, J.T. DeWolf, D.F. Mazurek Mechanics of Materials, McGraw-Hill, 2013
- J.M. Gere, S. Timoshenko Mechanics of Materials (8th Ed.), Cengage Learning, 2009

ADDITIONAL BIBLIOGRAPHY

- Russell C. Hibbeler Structural Analysis (9th Ed.), Pearson, 2014