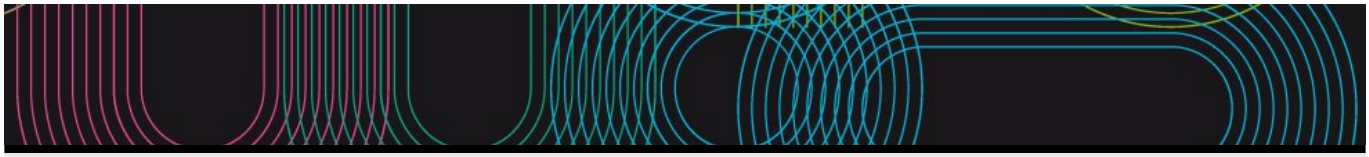

| IDENTIFYING DATA | | | | |
|---|---|---|---|---|
| **Mechanics of Materials** | | | | |
| Subject | Mechanics of Materials | | | |
| Code | V12G360V01404 | | | |
| Study programme | (*)Grao en Enxeñaría en Tecnoloxías Industriais | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 6 | Mandatory | 2nd | 2nd |
| Teaching language | | | | |
| Department | | | | |
| Coordinator | Caamaño Martínez, José Carlos | | | |
| Lecturers | Baamante Vázquez, Modesto Manuel Antonio<br>Caamaño Martínez, José Carlos<br>Lorenzo Mateo, Jaime Alberto<br>Pereira Conde, Manuel<br>Riveiro Rodríguez, Belén | | | |
| E-mail | jccaam@uvigo.es | | | |
| Web | http://faitic.uvigo.es | | | |
| General description | Introduction to linear elastic materials, and analysis of internal loadings, stress and strain relationships. Study of the fundamentals of mechanics of materials and particularization for shafts and beam structures. | | | |

| Competencies | |
|---|---|
| Code | |
| B3 | CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations. |
| B4 | CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering. |
| C14 | CE14 Knowledge and use of the principles of strength of materials. |
| D1 | CT1 Analysis and synthesis. |
| D2 | CT2 Problems resolution. |
| D9 | CT9 Apply knowledge. |
| D10 | CT10 Self learning and work. |
| D16 | CT16 Critical thinking. |
| D17 | CT17 Working as a team. |

| Learning outcomes | | | |
|---|---|---|---|
| Expected results from this subject | Training and Learning Results | | |
| To know the differences between rigid body and elastic solid.<br>To know the state of stress and deformation of a deformable solid and the relationship between them.<br>To apply the knowledge acquired to the determination of the maximum values of the stress at a point of a deformable solid.<br>To know the basic principles governing the strength of materials.<br>To know the relationships between the different stresses and strains they originate.<br>To apply the knowledge acquired to the determination of internal loads.<br>To apply the acquired knowledge on the calculation of stresses in bar elements.<br>To know the basics of the deformation of rod elements.<br>To apply the knowledge gained to sizing bar elements. | B3<br>B4 | C14 | D1<br>D2<br>D9<br>D10<br>D16<br>D17 |

| Contents |
|---|

| Topic | |
|---|---|
| 1. Introduction | 1.1 Introduction<br>1.2 Review of statics fundamentals and applied concepts for further progress in solid mechanics and stress analysis |
| 2. Axial load | 2.0 Stress and strain. Linear elastic materials<br>2.1. Normal stress in an axially loaded prismatic bar.<br>2.2. Equilibrium of a deformable body.<br>2.3. Stress-Strain diagram of ductile materials. Hooke's Law.<br>2.4. Elastic deformation of an axially loaded member.<br>2.5. Saint-Venant principle and superposition principle.<br>2.6. Statically governed problems.<br>2.7. Statically indeterminate problems.<br>2.8. Thermal stress and assembly misfits. |
| 3. Bending | 3.1 Beams: definition and types. Loads on beams.<br>3.2 Internal shear forces and bending moments.<br>3.3 External load, shear force and bending moment relationships.<br>3.4 Shear and moment diagrams<br>3.5 Pure bending and non-uniform bending. Hypothesis and limitations.<br>3.6 Normal stresses in unsymmetric bending.<br>3.7 Symmetric bending. The flexure formula (Navier's Law).<br>3.8 Section modulus of a beam. Ideal beam cross-section.<br>3.9 Deflection of beams and shafts. Rotation and displacement. Mohr's Theorems.<br>3.10 Statically indeterminate problems. |
| 4. Buckling of columns | 4.1. Critical load<br>4.2. Ideal column with pin supports<br>4.3. Columns having different types of supports. |
| 5. Transverse Shear | 5.1 Shear in straigh members<br>5.2. The shear formula<br>5.3. Design of joints. |
| 6. Torsion | 6.1. Torsional deformation of a circular shaft<br>6.2. The torsion formula<br>6.3. Angle of twist |

**Planning**

| | Class hours | Hours outside the classroom | Total hours |
|---|---|---|---|
| Master Session | 32.5 | 49 | 81.5 |
| Laboratory practises | 16 | 13 | 29 |
| Troubleshooting and / or exercises | 1 | 17.5 | 18.5 |
| Autonomous troubleshooting and / or exercises | 1 | 17 | 18 |
| Long answer tests and development | 3 | 0 | 3 |

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

**Methodologies**

| | Description |
|---|---|
| Master Session | Lecture where theoretical principles are presented using digital media, videos and blackboard. |
| Laboratory practises | Activities of application of the knowledge to concrete situations and of acquisition of basic skills and procedural skills related with the subject of study |
| Troubleshooting and / or exercises | Resolution of problems related to real case studies. |
| Autonomous troubleshooting and / or exercises | Collection of problems to be solved by the students that must be delivered as a coursework. |

**Personalized attention**

| Methodologies | Description |
|---|---|
| Laboratory practises | |
| Autonomous troubleshooting and / or exercises | |
| Master Session | |

**Assessment**

| | Description | Qualification | Training and Learning Results |
|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Laboratory practises | A) it will evaluate the attendance and active participation in all the practicals of the semester, as well as the correct delivery (time and form) of all the documentation requested (reports, exercises, etc.). Practical sessions will be held in a fixed date, so it is not possible to attend the practical in a later date. Whether the student does not attend to a practical, he/she must demonstrate that the absence was due to unavoidable reasons (e.g. medical reasons). Practicals will marked with the value indicated, only when the student reaches the minimum mark in the written exam, which is 45%. (See following section: 'Other comments') | 2.5 | B3 | C14 | D1<br>D2<br>D9<br>D10<br>D16<br>D17 |
| Troubleshooting and / or exercises | C) Written tests to evaluate the individual work delivered by the student in the previous sections (A and B). It will be compulsory the attendance to the 90% of the practicals and the on-time delivery of all the lists of problems explained in section B, to obtain the marks given in section C. The marks obtained in the sections A and B will proportionally affect to the marks of the section C. The section C will be marked with a maximum value of 10% of the total mark, only when the student obtain the minimum mark in the written exam, which is 45%. (See following section: 'Other comments') | 10 | B3<br>B4 | C14 | D1<br>D2<br>D9<br>D10<br>D16 |
| Autonomous troubleshooting and / or exercises | B) Lists of problems to solve individually by students will be published in the platform FAITIC-TEMA along the course. Each list of problems will have a deadline. All this coursework needs to be delivered to the corresponding lecturer in time and form, so they can be counted for marking. Any defect of form (out of term, absence of name, etc.) will invalidate the exercises and they will not be marked. When all the coursework are correctly submited, they will be marked with the value indicated. These marks will be added to the marks obtained in the written exam, once the student reaches the minimum mark in this exam, which is 45%. (See following section: 'Other comments') | 2.5 | B3<br>B4 | C14 | D1<br>D2<br>D9<br>D10<br>D16 |
| Long answer tests and development | Written exam in the dates established by the School. | 85 | B3 | C14 | D1<br>D2<br>D9<br>D10<br>D16 |

**Other comments on the Evaluation**

Students resigning continuum assessment (after School aproval) will be evaluated only through the written exam which will be graded with 100% of final mark.

Continuum assessment is composed of sections A, B, C. The maximum mark for continuum assessment (NEC) is 15%, which will be computed from the following equation: NEC (%) = (2'5·A) + (2'5·*B) + (C)·A·B ; where A,B: 0-1 and Cmáx= 10% of final mark.

Ethical commitment: it is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.)  shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).

The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

## Sources of information

Hibbeler, R., **Mechanics of materials**,

Hibbeler, R., **Mecánica de materiales**,

Manuel Vázquez, **Resistencia de materiales**,

González Taboada, J.A. 'Tensiones y deformaciones en materiales elásticos'. Ed. Autor. TOR 620 GON ten; IND T11 18

## Recommendations

### Other comments

Requirements: To register for this module the student must have passed or be registered for all the modules of the previous year.