



## IDENTIFYING DATA

### Solid mechanics in biomedical engineering

|                     |   |           |      |            |
|---------------------|---|-----------|------|------------|
| Subject             | Solid mechanics in biomedical engineering   |           |      |            |
| Code                | V12G420V01503   |           |      |            |
| Study programme     | Grado en Ingeniería Biomédica   |           |      |            |
| Descriptors         | ECTS Credits  | Choose    | Year | Quadmester |
|                     | 6   | Mandatory | 3rd  | 1st        |
| Teaching language   | Spanish   |           |      |            |
| Department          |   |           |      |            |
| Coordinator         | Comesaña Piñeiro, Rafael  |           |      |            |
| Lecturers           | Comesaña Piñeiro, Rafael<br>Riveiro Rodríguez, Antonio<br>Riveiro Rodríguez, Belén  |           |      |            |
| E-mail              | racomesana@uvigo.es   |           |      |            |
| Web                 |   |           |      |            |
| General description | In this subject will study the basic concepts of the mechanics of continuous means for the analysis of elastic solids and *viscoelásticos in devices, machines, structures or fabrics. They will enter the states of tensions and of deformations in a solid *deformable and will analyse his relations with the different types of *solicitaciones internal. |           |      |            |

## Skills

|      |   |
|------|---|
| Code |   |
| B3   | CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations. |
| B4   | CG2 Ability to direct activities related to the CG1 competence  |
| 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 |     |                                     |
| New                                | B3<br>B4                      | C14 | D1<br>D2<br>D9<br>D10<br>D16<br>D17 |

## Contents

|  |  |
|--|--|
| Topic  |  |
| Introduction to Elasticity and Mechanics of Materials applied to inert and biological materials. | - Fundamentals of Elasticity.<br>- Fundamentals of Viscoelasticity.<br>- Introduction to Failure Criteria. |

|   |  |
|---|--|
| Internal forces in biomedical devices and biomaterials. Stress and strain analysis. | <ul style="list-style-type: none"> <li>- Axial load</li> <li>- Bending</li> <li>- Torsion</li> <li>- Buckling</li> </ul> |
|---|--|

### Planning

|                                 | Class hours | Hours outside the classroom | Total hours |
|---------------------------------|-------------|-----------------------------|-------------|
| Problem solving                 | 15.5        | 32.5                        | 48          |
| Autonomous problem solving      | 0           | 18                          | 18          |
| Lecturing                       | 17          | 34                          | 51          |
| Laboratory practical            | 17          | 13                          | 30          |
| Essay questions exam            | 1           | 0                           | 1           |
| Problem and/or exercise solving | 2           | 0                           | 2           |

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

### Methodologies

|                            | Description   |
|----------------------------|---|
| Problem solving            | Each week, time will be devoted to the resolution of exercises or proposed problems by the student (contents related to the scheduled units).   |
| Autonomous problem solving | Exercises and/or problems will be proposed to solve autonomously, giving the results of the same, which will allow the student to evaluate the degree of achievement of the competences of the subject.     |
| Lecturing                  | The general aspects of the subject will be presented in a structured way, making special emphasis on the fundamentals and aspects that are most important or most difficult to understand for the students. |
| Laboratory practical       | Cooperative laboratory practices with which the theoretical concepts will be put into practice seen in the classroom.   |

### Personalized assistance

| Methodologies              | Description   |
|----------------------------|---|
| Autonomous problem solving | Time dedicated by the teacher to attend to the needs and queries of the students related to the content of the course. Personalized attention is recommended for that the student can verify that the work done autonomously is correct or, in the case contrary, so that you can identify the reasons why it is not. The teacher will report on the schedule available at the beginning of the course on the Moovi platform. Any alteration in the The same will be communicated in the Announcements section of the platform. |

### Assessment

|                                 | Description  | Qualification | Training and Learning Results |     |                                     |
|---------------------------------|--|---------------|-------------------------------|-----|-------------------------------------|
| Autonomous problem solving      | Resolution of problems and/or study of cases / analysis of situations to be addressed individually or in group.  | 10            | B3<br>B4                      | C14 | D1<br>D2<br>D9<br>D10<br>D16<br>D17 |
| Laboratory practical            | It will assess the active participation in all the classes and, where appropriate, the delivery of the reports of the practices and his content according to the guidelines given before his realisation. The qualification obtained will be the same in the 1 <sup>a</sup> and in the 2 <sup>a</sup> opportunity of the announcement of the course. | 5             | B4                            | C14 | D1<br>D2<br>D9<br>D10<br>D16<br>D17 |
| Essay questions exam            | Question of concept development, integrated in the final examination of the subject.   | 5             |                               |     |                                     |
| Problem and/or exercise solving | Exam about the subject, comprising the resolution by part of the student of problems and/or brief theoretical questions. The length of the examn, as well as the weight of each question, will give to know in the moment of realisation of the same.  | 80            | B3<br>B4                      | C14 | D1<br>D2<br>D9<br>D16               |

### Other comments on the Evaluation

To pass the subject it will be necessary to obtain a minimum score of 5 out of 10. The student who has approved the waiver

of continuous assessment may take the final exam, which will have a weight of 100% of the note. In this test the skills of the whole subject will be assessed. The date and places of the exams for all calls will be set by the center before the start of the exam. course and will make them public.

Ethical commitment: The student is expected to present appropriate ethical behavior. In case of detecting unethical behavior (copying, plagiarism, use of unauthorized electronic devices, etc.), it will be considered that The student does not meet the necessary requirements to pass the subject. In that case, the overall rating in the present academic course will be failed (0.0). The use of any electronic device during the evaluation tests will not be allowed, unless expressly authorized. The fact of introducing an unauthorized electronic device in the examination room will be considered grounds for Failure to pass the subject in the current academic year and the overall grade will be a fail (0.0).

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### Sources of information

#### Basic Bibliography

Russell C. Hibbeler, **Mecánica de Materiales**, 10a Edición, ADDISON-WESLEY,

#### Complementary Bibliography

Lisa A. Pruitt; Ayyana M. Chakravartula, **Mechanics of Biomaterials**, Cambridge University Press,

Luis Ortiz Berrocal, **Elasticidad**, 3ra Edición, MCGRAW-HILL,

José Antonio González, **Taboada, Tensiones y deformaciones en materiales elásticos**, Tórculo,

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### Recommendations

#### Other comments

To enrol in this matter is necessary to have passed or enrol of all the subjects of the previous courses.

The original educational guide is written in Spanish.

In case of discrepancies, will prevail the version in Spanish to this guide.