



## Teaching Guide

| Teaching Guide      |                                                                                                                       |        |                                                                           |           |
|---------------------|-----------------------------------------------------------------------------------------------------------------------|--------|---------------------------------------------------------------------------|-----------|
| Identifying Data    |                                                                                                                       |        |                                                                           | 2023/24   |
| Subject (*)         | FÍSICA II                                                                                                             | Code   |                                                                           | 730G04009 |
| Study programme     | Grao en Enxeñaría en Tecnoloxías Industriais                                                                          |        |                                                                           |           |
| Descriptors         |                                                                                                                       |        |                                                                           |           |
| Cycle               | Period                                                                                                                | Year   | Type                                                                      | Credits   |
| Graduate            | 2nd four-month period                                                                                                 | First  | Basic training                                                            | 6         |
| Language            | SpanishGalician                                                                                                       |        |                                                                           |           |
| Teaching method     | Face-to-face                                                                                                          |        |                                                                           |           |
| Prerequisites       |                                                                                                                       |        |                                                                           |           |
| Department          | Enxeñaría Industrial 2Enxeñaría Naval e Industrial                                                                    |        |                                                                           |           |
| Coordinador         | Tobar Vidal, María José                                                                                               | E-mail | maria.jose.tobar@udc.es                                                   |           |
| Lecturers           | Saavedra Otero, Emilio<br>Tobar Vidal, María José<br>Yañez Casal, Armando Jose                                        | E-mail | emilio.saavedra@udc.es<br>maria.jose.tobar@udc.es<br>armando.yanez@udc.es |           |
| Web                 |                                                                                                                       |        |                                                                           |           |
| General description | General laws of thermodynamics and electromagnetism, and their application in the resolution of engineering problems. |        |                                                                           |           |

## Study programme competences / results

| Code | Study programme competences / results                                                                                                                                                                                                                                                                                                                    |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A2   | FB2 Comprensión e dominio dos conceptos básicos sobre as leis xerais da mecánica, termodinámica, campos e ondas e electromagnetismo e a súa aplicación para a resolución de problemas propios da enxeñaría.                                                                                                                                              |
| B1   | CB1 Que os estudantes demostren posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral e adoita encontrarse a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo                        |
| B2   | CB2 Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo                                                                                 |
| B3   | CB3 Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitiren xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética                                                                                                                |
| B6   | B3 Ser capaz de concibir, deseñar ou poñer en práctica e adoptar un proceso substancial de investigación con rigor científico para resolver calquera problema formulado, así como de comunicar as súas conclusións ?e os coñecementos e razóns últimas que as sustentan? a un público tanto especializados como leigo dun xeito claro e sen ambigüidades |
| B7   | B5 Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas                                                                                                                                                                                                                                                           |
| B8   | B7 Deseñar e realizar investigacións en ámbitos novos ou pouco coñecidos, con aplicación de técnicas de investigación (con metodoloxías tanto cuantitativas como cualitativas) en distintos contextos (ámbito público ou privado, con equipos homoxéneos ou multidisciplinares etc.) para identificar problemas e necesidades                            |
| B9   | B8 Adquirir unha formación metodolóxica que garanta o desenvolvemento de proxectos de investigación (de carácter cuantitativo e/ou cualitativo) cunha finalidade estratéxica e que contribúan a situarnos na vangarda do coñecemento                                                                                                                     |
| C1   | C3 Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.                                                                                                                                                                       |
| C5   | C7 Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.                                                                                                                                                                                                                                                                      |

## Learning outcomes

| Learning outcomes | Study programme competences / results |
|-------------------|---------------------------------------|
|                   |                                       |



|                                                                                                                                                                                         |    |                                        |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------|----------|
| Understand and master the basic concepts about the general laws of thermodynamics, fields and waves and electromagnetism and its application for the resolution of engineering problems | A2 | B1<br>B2<br>B3<br>B6<br>B7<br>B8<br>B9 | C1<br>C5 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------|----------|

| Contents                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic                                                                                     | Sub-topic                                                                                                                                                                                                                                                                                                                                                                                    |
| The following sections develop the contents established in the "Memoria de Verificación"; | Principles of Thermodynamics.<br>Fundamentals of processes and thermal machines.<br>Electric and magnetic field. Electromagnetism.<br>Maxwell's equations                                                                                                                                                                                                                                    |
| THERMODYNAMICS                                                                            | UNIT 1. Thermal properties of matter.<br>UNIT 2. Zero principle of thermodynamics<br>UNIT 3. Heat and work. First Law of thermodynamics.<br>UNIT 4. Heat transfer processes.<br>UNIT 5. Transformations in thermodynamic systems. Applications of the first principle.<br>UNIT 6. Reversibility of processes. Second principle of thermodynamics.                                            |
| ELECTROMAGNETISM                                                                          | UNIT 7. Electric field<br>UNIT 8. Electric potential<br>UNIT 9. Electrostatic applications<br>UNIT 10. Electric current<br>UNIT 11. Magnetostatic. Forces on moving charges.<br>UNIT 12. Magnetic fields generated by currents.<br>UNIT 13. Magnetic properties of matter.<br>UNIT 14. Electromagnetic induction.<br>UNIT 15. Alternating current circuits.<br>UNIT 16. Maxwell's equations. |

| Planning                                                                                                                        |                         |                                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies / Results  | Teaching hours (in-person & virtual) | Student's personal work hours | Total hours |
| Guest lecture / keynote speech                                                                                                  | A2 B1 B2 B3 C1 C5       | 26                                   | 41.6                          | 67.6        |
| Problem solving                                                                                                                 | B2 B6 B7 B8 B9 C1       | 22                                   | 26.4                          | 48.4        |
| Laboratory practice                                                                                                             | B6 B8 B9 C1             | 8                                    | 12                            | 20          |
| Mixed objective/subjective test                                                                                                 | A2 B1 B2 B3 B6 B7<br>B8 | 4                                    | 6                             | 10          |
| Personalized attention                                                                                                          |                         | 4                                    | 0                             | 4           |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. |                         |                                      |                               |             |

| Methodologies                  |                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------------------|
| Methodologies                  | Description                                                                                   |
| Guest lecture / keynote speech | Lecturing about main concepts of the subject, Non presential, through institutional platform. |
| Problem solving                | Resolution of proposed problem assignments                                                    |
| Laboratory practice            | 3 practices + 1 exam must be completed in 8 hours, with delivering of reports.                |



|                                 |                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mixed objective/subjective test | In continuous assesment: intermediate exam with partial content (1/3 approximately) and final exam of the rest (2/3) of contents of the subject. It will consist of a theoretical part and another of problem solving.<br>Alternatively: Final exam with all the content of the subject. It will consist of a theoretical part and another of problem solving. |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Personalized attention |                                                                                                                                                                                                                                    |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies          | Description                                                                                                                                                                                                                        |
| Laboratory practice    | Discussion about the different aspects of the subject: theory, problems, lab assignments.<br><br>In the case of academic exemption, the student can solve doubts during tutoring time in the same way as the rest of the students. |

| Assessment                      |                        |                                                                            |               |
|---------------------------------|------------------------|----------------------------------------------------------------------------|---------------|
| Methodologies                   | Competencies / Results | Description                                                                | Qualification |
| Mixed objective/subjective test | A2 B1 B2 B3 B6 B7 B8   | Theory accounts for 40% and problems for 60% of the total points obtained. | 90            |
| Laboratory practice             | B6 B8 B9 C1            | Mandatory: No unexcused absences.                                          | 10            |

| Assessment comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <p>Two objective tests, partial and final will be held. Both will be celebrated according to exam dates approved by the School Board. They consist of theory and practice (problems) with a maximum duration of 4 hours.</p> <p>Partial test will cover contents revised up to the date of the exam. Points obtained will account for the 30% of the overall mark.</p> <p>Final test will cover all the contents of the subject. It will represent 90% of the overall mark for students which have not attended the partial exam. Those who have attended may be examined of the remaining part. The points obtained will represent 60% of the overall mark. Alternatively, they may choose to be examined of the whole subject material in order to raise their partial mark.</p> <p>On second opportunity, examination will cover the whole contents. Partial results and laboratory practice will preserve their validity as in first opportunity.</p> <p>Assistance to laboratory practice is mandatory and to be done in first year enrolment. Points obtained will be kept for 3 consecutive courses. No unexcused absences allowed. Student must attend 3 laboratory practices and a final (individual) examination</p> <p>Part-time students as defined by "Norma que regula o réxime de dedicación ao estudo dos estudantes de grao na UDC" must inform the coordinator professor. Assessment will be performed on the same basis as that of full-time students. Exemption of class attendance will not be applied to Laboratory practices, which must be attended on scheduled days including the final examination.</p> <p>Fraudulent performance of tests or evaluation activities, once verified, will directly imply the qualification of failing in the call in which it is committed: the student will be graded with "fail" (numerical grade 0) in the corresponding call for the course academic, whether the commission of the offense occurs on the first opportunity or on the second. For this, their qualification will be modified in the first opportunity certificate, if necessary.</p> <p>-According to the different applicable regulations for university teaching, the gender perspective must be incorporated in this matter (non-sexist language will be used, bibliography of authors of both sexes will be used, intervention in class of students will be encouraged and students...)</p> <p>-Work will be done to identify and modify prejudices and sexist attitudes and the environment will be influenced to modify them and promote values of respect and equality.</p> <p>-Situations of discrimination based on gender must be detected and actions and measures to correct them will be proposed.</p> |

| Sources of information |
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|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Basic</b>         | <ul style="list-style-type: none"><li>- Giancoli, Douglas C. (2002). Física para universitarios. Pearson Educación</li><li>- Giancoli, Douglas C. (2009). Física para ciencias e ingeniería. Pearson educación</li><li>- Serway, Raymond A. (2008). Física : para ciencias e ingenierías. Cengage Learning</li><li>- Paul A. Tipler, Gene Mosca. (2011). Física para la ciencia y la tecnología. Reverté</li><li>- Francis W. Sears, Mark. W. Zemansky (2009). Física universitaria. Addison-Wesley</li><li>- Alcaraz i Sendra, Olga (2006). Física : problemas y ejercicios resueltos. Pearson</li><li>- Burbano de Ercilla, Santiago (1991). Física General: problemas. Mira Editores</li><li>- M. R. Fernández, J. A. Fidalgo (1994). 1000 Problemas de física general. Everest, Madrid</li><li>- Oliver Pina, Ramón (1987). Problemas de física: resueltos y explicados. ETSII , Madrid</li></ul> |
| <b>Complementary</b> | <ul style="list-style-type: none"><li>- Roald K. Wangsness (). Campos Electromagnéticos. Limusa</li><li>- Francis Sears, Gerhard Salinger (). Termodinámica, Teoría Cinética y Termodinámica Estadística. Reverté</li><li>- Zemanski, Dittman (). Calor y Termodinámica. McGraw-Hill</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## Recommendations

### Subjects that it is recommended to have taken before

### Subjects that are recommended to be taken simultaneously

Calculus /730G03001

Physics I /730G03003

Linear Algebra/730G03006

### Subjects that continue the syllabus

Fundamentals of Electricity/730G03012

Thermodynamics /730G03014

Fundamentals of Electronic Circuits/730G03016

Industrial Heat Transfer/730G03020

### Other comments

1. The delivery of the documentary works for this subject:&nbsp;1.1. Will be requested in virtual format and / or computer support.&nbsp;1.2. Will be done through Moodle, in digital format avoiding the need of printing.1.3. If made on paper:&nbsp;-Do not use plastics.&nbsp;-Double sided printing will be made.&nbsp;-Recycled paper will be used.&nbsp;-The printing of drafts will be avoided.2. Sustainable use of resources and prevention of harm to the natural environment must be observed.

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.