



| Teaching Guide      |  |        |   |         |
|---------------------|--|--------|---|---------|
| Identifying Data    |  |        | 2020/21   |         |
| Subject (*)         | Física aplicada II   | Code   | 632G02005   |         |
| Study programme     | Grao en Tecnoloxía da Enxeñaría Civil  |        |   |         |
| 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 Naval e Industrial   |        |   |         |
| Coordinador         | Garcia Fernandez, M. Del Carmen  | E-mail | c.garciaf@udc.es  |         |
| Lecturers           | Galan Díaz, Juan José<br>Garcia Fernandez, M. Del Carmen<br>Martínez Díaz, Margarita   | E-mail | juan.jose.galan@udc.es<br>c.garciaf@udc.es<br>margarita.martinez@udc.es |         |
| Web                 | campusvirtual.udc.es/moodle/   |        |   |         |
| General description | The fundamental objective of this matter is to provide the student with a clear and logical presentation of the basic concepts and principles of physics, and strengthen the understanding of these concepts and principles across a wide range of interesting applications to the real world. To achieve in a full way this objective, students must already have acquired their training in the subject taught in Física Aplicada I. |        |   |         |



|                         |  |
|-------------------------|--|
| <p>Contingency plan</p> | <p>1. Changes in content</p> <p>In essence, the content does not change.</p> <p>2. Methodologies</p> <p>* Teaching methodologies that are maintained</p> <p>The methodologies used during face-to-face teaching are maintained, although adapted to the characteristics of non-face-to-face teaching (see next section).</p> <p>* Teaching methodologies that are modified</p> <p>The master classes will be in audio conference format via Teams. The student will previously receive the contents in .pdf format through Moodle.</p> <p>In the problem classes, the student will already have the solution of the same, sent through Moodle, to facilitate note taking during the joint correction via Teams.</p> <p>In any case, the audio conferences will be open so that the students can ask the questions they want during their course. Teams sessions are recorded and available for student review or if they are unable to attend synchronously.</p> <p>3. Mechanisms for personalized attention to students</p> <p>Email (short questions), Moodle Forum (short questions), Teams (tutorials and exam review). The first two will be consulted regularly from Monday to Friday and exceptionally on weekends. Attention through Teams will require an appointment by email / Moodle.</p> <p>4. Modifications in the evaluation</p> <p>In the event that attendance is not possible, the recommendations given by the UDC at the end of the 2019/20 academic year will be followed. Therefore, the evaluation will be distributed as follows:</p> <p>a) 60% continuous evaluation</p> <p>It will consist of carrying out a novel job that involves the active participation of the students and that can provide the skills that would be obtained in the practices. In addition, small tests will be carried out (exercises, questionnaires, etc. through Moodle) and / or problem solving will be proposed as a Moodle task.</p> <p>b) 40% synchronous test</p> <p>On the official exam date there will be a test through Moodle and controlled by Teams. It will consist of answering short questions and / or questionnaires and delivering one or more small exercises solved in real time.</p> <p>* Evaluation observations:</p> <p>The exact distribution of the score will be agreed with the students according to the point in time of the course in which the contingency plan must be applied.</p> <p>In any case, the student must obtain a 2 out of 4 in the synchronous test to pass the subject.</p> <p>5. Modifications to the bibliography or webgraphy.</p> |
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They do not change In any case, the teacher will try to send students supplementary material, if necessary.



| Study programme competences / results |   |
|---------------------------------------|---|
| Code                                  | Study programme competences / results   |
| A1                                    | Capacidad para plantear y resolver los problemas matemáticos que puedan plantearse en el ejercicio de la profesión. En particular, conocer, entender y utilizar la notación matemática, así como los conceptos y técnicas del álgebra y del cálculo infinitesimal, los métodos analíticos que permiten la resolución de ecuaciones diferenciales ordinarias y en derivadas parciales, la geometría diferencial clásica y la teoría de campos, para su aplicación en la resolución de problemas de Ingeniería Civil. |
| A2                                    | Uso y programación de ordenadores.  |
| A3                                    | Capacidad para resolver numéricamente los problemas matemáticos más frecuentes en la ingeniería, desde el planteamiento del problema hasta el desarrollo de la formulación y su implementación en un programa de ordenador. En particular, capacidad para formular, programar y aplicar modelos numéricos avanzados de cálculo, así como capacidad para la interpretación de los resultados obtenidos en el contexto de la ingeniería civil, la mecánica computacional y/o la ingeniería matemática, entre otros.   |
| A4                                    | Comprensión de la aleatoriedad de la mayoría de los fenómenos físicos, sociales y económicos, que permite actuar de la forma correcta en la toma de decisiones ante la presencia de incertidumbre y efectuar análisis y crítica racional de actuaciones.  |
| A5                                    | Capacidad para resolver los problemas físicos básicos de Ingeniería Civil, y conocimiento teórico y práctico de las propiedades físicas, químicas, mecánicas y tecnológicas de los materiales de construcción más utilizados en construcción.   |
| A6                                    | Capacidad para documentarse, obtener información y aplicar los conocimientos de materiales de construcción en sistemas estructurales. Conocimientos de la relación entre la estructura de los materiales y las propiedades mecánicas que de ella se derivan, incluyendo la caracterización microestructural. Conocimiento, comprensión y capacidad para aplicar los métodos, procedimientos y equipos que permiten la caracterización mecánica de los materiales, tanto experimentales como analíticos.             |
| A7                                    | Comprensión y dominio de los conceptos básicos sobre las leyes generales del movimiento mecánico y del equilibrio de los cuerpos materiales, y capacidad para su aplicación en la resolución de problemas de Mecánica.  |
| A25                                   | Conocimiento y comprensión del funcionamiento de los ecosistemas y los factores ambientales con el fin de inventariar el medio, aplicando metodologías de valoración de impactos para su empleo en estudios y evaluaciones de Impacto Ambiental.  |
| A35                                   | Capacidad para concretar ante un problema constructivo alternativas válidas y elegir la óptima, previendo los problemas de su construcción.   |
| A36                                   | Conocimiento del marco técnico, económico y legislativo, así como los procedimientos constructivos, la maquinaria de construcción y las técnicas de planificación de las obras.   |
| B1                                    | Que los estudiantes hayan demostrado poseer y comprender conocimientos en un área de estudio que parte de la base de la educación secundaria general, y se suele encontrar a un nivel que, si bien se apoya en libros de texto avanzados, incluye también algunos aspectos que implican conocimientos procedentes de la vanguardia de su campo de estudio   |
| B2                                    | Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio   |
| B3                                    | Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética  |
| B4                                    | Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado   |
| B5                                    | Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía  |
| B6                                    | Resolver problemas de forma efectiva.   |
| B7                                    | Aplicar un pensamiento crítico, lógico y creativo.  |
| B8                                    | Trabajar de forma colaborativa.   |
| B9                                    | Comportarse con ética y responsabilidad social como ciudadano y como profesional.   |
| B10                                   | Comunicarse de manera efectiva en un entorno de trabajo.  |
| B11                                   | Entender y aplicar el marco legal de la disciplina.   |
| B12                                   | Comprensión de la necesidad de actuar de forma enriquecedora sobre el medio ambiente contribuyendo al desarrollo sostenible.  |
| B13                                   | Comprensión de la necesidad de analizar la historia para entender el presente.  |
| B14                                   | Capacidad para organizar y dirigir equipos de trabajo así como de integrarse en equipos multidisciplinares.   |
| B15                                   | Claridad en la formulación de hipótesis.  |
| B16                                   | Capacidad de autoaprendizaje mediante la inquietud por buscar y adquirir nuevos conocimientos, potenciando el uso de las nuevas tecnologías de la información y así poder enfrentarse adecuadamente a situaciones nuevas.   |
| B17                                   | Capacidad para aumentar la calidad en el diseño gráfico de las presentaciones de trabajos.  |



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|-----|---|
| B18 | Capacidad para aplicar conocimientos básicos en el aprendizaje de conocimientos tecnológicos y en su puesta en práctica.  |
| B19 | Capacidad de realizar pruebas, ensayos y experimentos, analizando, sintetizando e interpretando los resultados.   |
| C1  | Expresarse correctamente, tanto de forma oral como por escrito, en las lenguas oficiales de la comunidad autónoma.  |
| C2  | Dominar la expresión y la comprensión de forma oral e escrita de un idioma extranjero.  |
| C3  | Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de la vida.   |
| C4  | Desarrollarse para el ejercicio de una ciudadanía abierta, culta, crítica, comprometida, democrática y solidaria, capaz de analizar la realidad, diagnosticar problemas, formular e implantar soluciones basadas en el conocimiento y orientadas al bien común. |
| C5  | Entender la importancia de la cultura emprendedora y conocer los medios al alcance de las personas emprendedoras.   |
| C6  | Valorar críticamente el conocimiento, la tecnología y la información disponible para resolver los problemas con que deben enfrentarse.  |
| C7  | Asumir como profesional y ciudadano la importancia del aprendizaje a lo largo de la vida.   |
| C8  | Valorar la importancia que tiene la investigación, la innovación y el desarrollo tecnológico en el avance socioeconómico y cultural de la sociedad.   |

| Learning outcomes   |                                       |                                     |                |
|---|---------------------------------------|-------------------------------------|----------------|
| Learning outcomes   | Study programme competences / results |                                     |                |
| Expose and resolve of a theoretical way the his more and his less physical-mathematical related with the Civil Engineering. In particular, know, understand and use the mathematical note, as well as the concepts, the basic physical principles and the analytical methods that allow the resolution of said his more and his less. | A1<br>A4<br>A5                        | B8<br>B16<br>B19                    |                |
| Apply the theoretical knowledges purchased in the resolution of his more and his less than exposes in own works of the professional exercise, taking how model examples analysed in the exercises of the matter, but knowing at the same time enter the variations of the conditions of outline that impose the own reality.          | A1<br>A7                              | B17<br>B18                          |                |
| Knowing the basic characteristics to level of physical behaviour-structural of the most employed materials in the Civil Engineering   | A4                                    |                                     |                |
| Check the theoretical knowledges purchased contribution of the physical behaviour-structural of the materials in concrete examples of his application in works of Civil Engineering. Influence of external conditionings of all type (climatic, economic, environmental, efforts to bear, etc).                                       | A4                                    | B14                                 | C6             |
| Continuous recycling of knowledges in the global field of performance of the Civil Engineering. Comprise the importance of the innovation in the profession.  | A1<br>A2                              | B8<br>B14                           |                |
| Ease for the integration in multidisciplinary teams. Capacity to organise and direct teams of work. Work of form colaborativa. Communicate of effective way in some surroundings of work  |                                       | B5<br>B7<br>B15                     | C1<br>C2<br>C8 |
| Capacity to confront the young situations. Resolve his more and his less than effective form. Apply a critical thought, logical and creative.   |                                       | B1<br>B2<br>B3<br>B4<br>B8          | C7             |
| Express properly, so much of oral form as written, in the official tongues of the autonomous community.   |                                       |                                     | C1<br>C2       |
| Use the basic tools of the Technology of the Information that are of frequent use during the exercise of the profession.  | A2                                    | B10                                 | C3             |
| Exercise of an open citizenship, literate, critical, committed, democratic ysolidaria, able to analyse the reality, diagnose his more and his less, formulate and implant solutions based in the knowledge and oriented to the common wealthfare.   |                                       | B1<br>B3<br>B6<br>B11<br>B12<br>B13 | C4<br>C5       |
| Communicative skills and clarity of oral exhibition and written.  |                                       | B9                                  |                |



|  |                  |                              |          |
|--|------------------|------------------------------|----------|
| Capacity to realise proofs, essays and experiments, analysing, concretising and interpreting the results.  | A1<br>A35<br>A36 |                              |          |
| Understand the importance of the dynamic culture and know the means near at hand of the dynamic people . Assume how professional and citizen the importance of the learning to the long of the life. Value the importance that has the investigation, the innovation and the technological development in the socioeconomic and cultural advance of the society. |                  | B1<br>B3                     | C5       |
| Basic principles to analyze and understand how the characteristics of the structures that influence their behavior, as well as to know the typologies most usual in Civil Engineering.   | A1<br>A5         | B8                           |          |
| Exploitation and incorporation of the new technologies in his more and his less practical related with the matter.   | A2<br>A3<br>A6   | B10                          | C3<br>C6 |
| Understanding of the need to act of form enriquecedora on the environment contributing to the sustainable development  | A25              | B6<br>B12<br>B14             | C4<br>C6 |
| Capacity of analysis, synthesis and structuring of the information and the Ideas. Clarity in the approach of hypothesis.<br>Capacity of abstraction  | A1<br>A5<br>A35  | B1                           |          |
| Capacity of personal work, organised and scheduled. Capacity of autoaprendizaje by means of the restlessness for looking for and purchase new knowledges, improving the use of the new technologies of the information. Work of autonomous form with initiative  | A1               | B3<br>B8<br>B9<br>B11<br>B13 |          |
| Capacity of autoaprendizaje using the new technologies of the information, doing experiments and works in the laboratory   | A1               | B16<br>B18<br>B19            | C8       |
| Skill to do outlines and achieve results by means of schemes   |                  | B17                          |          |

| Contents                              |   |
|---------------------------------------|---|
| Topic                                 | Sub-topic   |
| Theme 1. Heat and Thermodynamics      | Heat and its measurement. Change of State. Transmission of heat. First law of thermodynamics. Second law of thermodynamics. Thermal machines.                                   |
| Theme 2. Electrostatic                | Fundamental principles of electrostatic. Electric field. Potential energy of a point. Potential function of the electrostatic field . Energy associated with an electric field. |
| Theme 3. Electric field in matter     | Conductors loaded in balance. Phenomena of influence. Capacitors. Dielectric.   |
| Theme 4. Continuous or direct current | Fundamental concepts. Electromotive force. Electric circuits.   |
| Theme 5. Magnetic field               | Fundamental concepts. Strength of Lorentz and his aplications. Biot and Savart?s law. Ampere's law. Induced currents.   |
| Theme 6. Mechanics of fluids          | Basic concepts. Hydrostatic. Surface tension. Capillary action.   |
| Theme 7. Wave motions                 | Fundamental concepts. General equation of of waves Energy of the waves. Doppler effect. Standing waves. Diffraction, reflection, and refraction.                                |

| Planning                        |   |                                      |                               |             |
|---------------------------------|---|--------------------------------------|-------------------------------|-------------|
| Methodologies / tests           | Competencies / Results                              | Teaching hours (in-person & virtual) | Student?s personal work hours | Total hours |
| Introductory activities         | A4 B8 B11 B12 B13<br>B15 B1 B6 B7 C2 C4<br>C5 C6 C7 | 20                                   | 20                            | 40          |
| Mixed objective/subjective test | A5 A35 B9 B2 B4                                     | 5                                    | 10                            | 15          |



|                        |   |    |    |    |
|------------------------|---|----|----|----|
| Laboratory practice    | A1 A2 A3 A7 B10 B3<br>B5 B16 B17 B18 B19<br>C8 C3 | 11 | 22 | 33 |
| Problem solving        | A1 A2 A3 A6 A25 A36                               | 24 | 24 | 48 |
| Personalized attention |   | 14 | 0  | 14 |

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

| Methodologies                   |  |
|---------------------------------|--|
| Methodologies                   | Description  |
| Introductory activities         | They will consist basically on theoretical explanations of the different sections of the agenda. They will also contextualize each topic within its possible practical applications for professional life.                           |
| Mixed objective/subjective test | Test that comprises brief theoretical questions and practical exercises.   |
| Laboratory practice             | Practical analysis of specific topics proposed by the teacher or current issues related to the curriculum. This analysis will be carried out in the laboratory or in the classroom using innovative teaching-learning methodologies. |
| Problem solving                 | Resolution of proposed exercises related to all the theory explained.  |

| Personalized attention  |   |
|---|---|
| Methodologies   | Description   |
| Introductory activities<br>Problem solving<br>Laboratory practice | <p>Mentoring hours will be provided, either individual or collective, for the solution of the difficulties that may appear during the course of the semester. Likewise, the professors will answer by e-mail the specific doubts that the students consult them.</p> <p>In the case of problem solving, the student will have to contact the teacher in the case that, once exposed in class, explained and reviewed at home by the student, the latter considers that he does not understand them or needs more examples to strengthen your understanding.</p> <p>The personalized attention will be the predominant in the case of laboratory practices, which will be carried out in small groups, and during which the teacher will supervise the work of each student and commenting with him on the different aspects observed.</p> |

| Assessment                      |   |  |               |
|---------------------------------|---|--|---------------|
| Methodologies                   | Competencies / Results                            | Description  | Qualification |
| Mixed objective/subjective test | A5 A35 B9 B2 B4                                   | Realization of the examinations organized in the general planning of the course.                               | 90            |
| Laboratory practice             | A1 A2 A3 A7 B10 B3<br>B5 B16 B17 B18 B19<br>C8 C3 | They will evaluate both the attitude of the student in the laboratory and the memory of the practices realized | 10            |

| Assessment comments |
|---------------------|
|                     |



Class attendance and participation, as well as the results obtained in "surprise" tests, will only serve to round up or define the final grade and provided that the student has obtained an "acceptable" mark in the mixed test.

The 10% corresponding to the laboratory practices + speaking test (with or without a short report on the subject) will be taken into account only when the student reaches at least a 3.5 out of 9 in the mixed test.

Below are the basic rules to follow during the performance of the mixed test:

Only the writing instruments, calculator and ID card can be on the test table. Mobile phones must be disconnected and stored at all times and can not be used to check the time. The exam sheet will be flipped when instructed by the teacher. The sheets must be numbered correctly and signed on the first and last page of the exam at the end of the same. The exam can not be done in pencil or use any type of corrector. Each student will be attentive only to his exam, any attempt to look at the exam of a partner will mean the loss of 1.5 points. In case of recidivism, the exam will be withdrawn. In case of transmission of information between students, the exam will be withdrawn to both. The duration of the exam will be set by the teacher at the beginning of the same, not having extra time, unless otherwise indicated. When the exam is finished, a flight will be left on the table and the student will leave without making any noise or comment, otherwise he will be sanctioned with the loss of 1.5 points. The date and time of review will be unique, only exceptions that are highly justified and prior will be addressed. A list will be taken before the review, and students who arrive later will not be able to join it. - Each student will be attentive only to his examination, any attempt to throw a glimpse to the examination of a mate will suppose the loss of 1,5 points. - In case of reincidencia will withdraw him the examination. In case of transmission of information between students the examination will be them withdrawn to the two. - The length of the examination will be fixed by the/to professor/the to the beginning of the even; not having extra time, except indication in contrary. When it finish the student will leave without doing noise neither comment any, in contrary case will be able to be sanctioned with the loss of 1,5 points. - The date and hour of the review will be only, only will attend exceptions that are very justified. It will happen list before the review, not being able to incorporate to the same students that arrive subsequently. The same criteria will be applied in the opportunity of July

### Sources of information

|                      |  |
|----------------------|--|
| <b>Basic</b>         | <ul style="list-style-type: none"> <li>- Beer y Johston (). Mecánica vectorial para ingenieros. Ed. Mc Graw-Hill</li> <li>- Alonso y Finn (). Física I y II. Fondo Educativo Interamericano</li> <li>- Burbano de Ercilla (). Física General. Tebar</li> <li>- Rossell (). Física general. Ed. AC</li> <li>- Sears, Zemansky, Young, Freedman (2013). Física Universitaria. Pearson</li> <li>- Moran, Shapiro et al. (2011). Principles of Engineering Thermodynamics. Wiley</li> <li>- Tipler, P.A.; Mosca, G. (2010). Física para la ciencia y la tecnología.. Reverté</li> </ul> <p>Os apuntes de clase estarán baseados na bibliografía antedita. O libro Física General de Burbano recomendase por ser un bo compendio técnico da materia, asemade ten un libro de problemas ordeados por conceptos. Sen embargo, tanto o Zemansky como o Tipler relatan mellor os fenómenos físicos.</p> |
| <b>Complementary</b> | <ul style="list-style-type: none"> <li>- Spiegel y Avellanas (). Fórmulas y tablas de matemática aplicada. Ed. Mc Graw-Hill</li> </ul>   |

### Recommendations

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

Cálculo infinitesimal I/632G02001  
 Física aplicada I/632G02004  
 Álgebra lineal I/632G02007  
 Materiais de construción I/632G02009

#### Subjects that are recommended to be taken simultaneously

Cálculo infinitesimal II/632G02002  
 Álgebra lineal II/632G02008  
 Materiais de construción II/632G02010

#### Subjects that continue the syllabus

Mecánica/632G02014  
 Resistencia de materiais/632G02018  
 Ciencia de Materiais (plan 2016)/632G02138

#### Other comments





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(\*)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.