



IDENTIFYING DATA

Physics: Physics II

| | | | | |
|---------------------|---|-----------------|------|------------|
| Subject | Physics: Physics II | | | |
| Code | V10G061V01203 | | | |
| Study programme | (*)Grao en Ciencias do Mar | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 6 | Basic education | 2nd | 1st |
| Teaching language | Galician | | | |
| Department | | | | |
| Coordinator | Lugo Latas, Luis | | | |
| Lecturers | Iglesias Prado, Jose Ignacio Lugo Latas, Luis | | | |
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| General description | Physics, as a science, deals with the description of matter and its interactions, developing theories in accordance with empirical knowledge. From this definition one can study nature from the smallest scales (subatomic) to the macroscopic scale, hence the different branches of Physics. Physics is the base of an uncountable number of scientific and technological applications, and in particular for the Sea Sciences student it's a basic tool to understand other theories and subjects in the following years of the grade. The knowledge and application of laws and principles studied in Physics allows the interpretation of the marine environment and the development of models related with it. Furthermore, it is important to understand the fundamental physics concepts to understand how the instruments work and to know how to use and control them. | | | |

Competencies

| | |
|------|---|
| Code | |
| A5 | Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy |
| B1 | Know and use vocabulary, concepts, principles and theories related to oceanography and apply everything learned in a professional and/or research environment. |
| B3 | Recognize and implement good practices in measurement and experimentation, and work responsibly and safely both in field surveys and in the laboratory. |
| C1 | know at a general level the fundamental principles of sciences: Mathematics, Physics, Chemistry, Biology and Geology. |
| C4 | Know, analyze and interpret the physical properties of the ocean according to current theories, as well as to know the most relevant sampling tools and techniques. |
| C5 | Formulate the mass, energy and moment conservation equations for geophysical fluids and solve them in basic oceanic processes. |
| D1 | Develop the search, analysis and synthesis of information skills oriented to the identification and resolution of problems. |
| D2 | Acquire the ability to learn autonomously, continuously and collaboratively, organizing and planning tasks over time. |

Learning outcomes

| Expected results from this subject | Training and Learning Results | | | |
|--|-------------------------------|----------|----------------|----------|
| 1.- Know the fundamental principles of the Thermodynamic and know applied to realize global analyses of thermodynamic systems of interest in Sciences of the Sea. Comprise and know use the relations and *diagramas *termodinámicos that describe the different properties of the substances. Know the cycles *termodinámicos basic of thermal machine and *refrixeración and his main applications in Sciences of the Sea. Know collaborate in the work with other people of communicative and constructive form in the manufacture of experiments *termodinámicos. | A5 | B1 B3 | C1 C4 C5 | D2 |
| 2.- Resolve problems of theory of fields and equations of the physical-mathematical chords with the paper of the fields in Sciences of the Sea. Argue the resolution of problems by means of it logical scientist and the scientific methodology. | A5 | B1 B3 | C1 C4 C5 | D1 D2 |

| | | | | |
|---|----|----------|----------------|----------|
| 4.- Identify the parameters that characterize a wave. Resolve problems envelope to *propagación of waves and his incidence envelope the means. Know resolve the implications of *emisores or receiving of wave in movement. Know collaborate in the work with other people of communicative and constructive form in the manufacture of one experience of waves. | A5 | B1 B3 | C1 C4 C5 | D1 D2 |
| 5.- Determine the physical parameters that define the behaviour of the subject in witnesses of electric fields *y magnetic. Identify the #phenomenon of *inducción electromagnetic. Identify the understanding of the *electromagnetismo through the *invarianza of the *ecuaciones of Maxwell. Identify the parameters that characterize an electromagnetic wave. Resolve problems envelope to *propagación and radiation of electromagnetic waves in distinct means. Distinguish the *particularidades behavioural of the electromagnetic fields. Identify differentiate and basic similarities between electromagnetic wave and acoustic wave/mechanics. | A5 | B1 B3 | C1 C4 C5 | D1 D2 |
| 6.- Know and identify the physical properties more *relevantes in the water of the sea so much from a fundamental point of view how to realize oceanographic studios. Be able of *recabar and #analyze the necessary information to carry out *tareas where the physical behaviour of the water of the sea was *relevante. | A5 | B1 B3 | C1 C4 C5 | D1 D2 |

Contents

Topic

| | |
|---|---|
| 1.- Thermodynamics | 1.- Introduction. Extensive and intensive magnitudes. Definitions. 2.- Thermal balance and zeroth law of thermodynamics. 3.- Heat. capacity and specific heat. Phase change and latent heat. 4.- Thermal exchanges of energy: conduction, convection and radiation. 5.- First law. Internal energy. 6.- The ideal gase. 7.- Heat engine and refrigerator. 8.- Entropy. |
| 2.- Elementary theory of fields | 1.- Introduction and concept of field. Types of fields 2.- Gradient of a scalar field. 3.- Circulation of a vector field. 4.- Flow and divergence of a vector field. Gauss' theorem. Solenoidal fields. 5.- Curl of a vector field. Stokes' theorem. Conservative fields. |
| 3.- Basic principles of fluid mechanics | 1.- Fluid characterization. Pressure and density. 2.- Fluid statics. Archimedes' principle. 3.- The continuity equation. Bernoulli's equation. 4.- The viscous fluid. 5.- Navier-Stokes' equation. 6.- Energy equation. |
| 4.- Waves | 1.- Types of wave. Wave interference. Diffraction, reflection and refraction of waves. 2.- Wave phenomena. 3.- Doppler effect. 4.- Introduction to ocean waves. |
| 5.- Basics of electromagnetism. | 1.- Electric charge. Electric field. Magnetic field. Maxwell's laws. 2.- Electromagnetic waves 3.- The spectrum of electromagnetic radiation 4.- Interaction with matter. 5.- The black body radiation. Stefan-Boltzmann's law. |
| 6.- Basic properties of the sea water. | 1. Mechanical properties: density, viscosity, surface tension and compressibility. 2. Thermal properties: changes of phase, specific and latent heats, thermal conductivity and thermal dilatation. 3. Electromagnetic properties: conductivity and refraction index. |

Planning

| | Class hours | Hours outside the classroom | Total hours |
|---|-------------|-----------------------------|-------------|
| Laboratory practical | 15 | 15 | 30 |
| Seminars | 7 | 0 | 7 |
| Lecturing | 30 | 13 | 43 |
| Problem and/or exercise solving | 0 | 30 | 30 |
| Report of practices, practicum and external practices | 0 | 15 | 15 |
| Portfolio / dossier | 0 | 25 | 25 |

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

| Methodologies | |
|----------------------|--|
| | Description |
| Laboratory practical | Realización de diversas prácticas de laboratorio en las que el alumnado adquirirá los conocimientos básicos del procedimiento experimental en física, así como el cálculo de incertidumbres en las variables físicas determinadas. La asistencia a las prácticas de laboratorio y la entrega, en tiempo y forma, de la memoria correspondiente es obligatoria para superar la materia en el año en curso |
| Seminars | Resolución de diversos ejercicios y problemas relacionados con lo analizado en las sesiones magistrales y que presenten más dudas o que sean de mayor dificultad. Organización del trabajo realizado en el e-portfolio. Se propondrán boletines de problemas que el alumno debe resolver por sí mismo |
| Lecturing | Exposición y explicación de los diversos conceptos físicos y de las distintas leyes con las que se relacionan, mostrando la manera de alcanzar los objetivos y haciendo hincapié en aquellos aspectos que resulten más problemáticos y dificultosos y resolviendo distintos ejemplos/problemas. Se propondrán distintas referencias bibliográficas. |

Personalized assistance

| Methodologies | Description |
|----------------------|--|
| Seminars | Students willing so could attend personal tutorials to solve doubts and/or uncertainties, which will mainly take place during the timetables indicated. To better optimise the procedure, the student is requested to previously contact his/her teacher with reasonable anticipation. |

Assessment

| | Description | Qualification | Training and Learning Results |
|---|--|---------------|-------------------------------|
| Problem and/or exercise solving | It Will evaluate the assimilation of knowledges of the students with a test based on problems related with the subject. The exam will be developed according to the official calendar: http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3 | 40 | A5 C1 D1 C4 D2 C5 |
| Report of practices, practicum and external practices | It will qualify the realization of the laboratory experimets and the report in groups of two students. | 25 | A5 B1 C1 D2 B3 C4 |
| Portfolio / dossier | Developing of a "porfolio" based on the subject in groups of two students. | 35 | A5 B1 C1 D1 B3 C4 D2 |

Other comments on the Evaluation

Date, time and place of exams will be published in the official web of Marien Sciences
Faculty: <http://mar.uvigo.es/index.php/en/alumnado-actual-2/examenes-3>

In July's test only a written proof will be made, corresponding to problem solving, with a weight of 40% of the final grade. Students are strongly requested to fulfil a honest and responsible behaviour. It is considered completely unacceptable any alteration or fraud (i.e., copy or plagiarism) contributing to modify the level of knowledge and abilities acquired in exams, evaluations, reports or any kind of teacher's proposed work. Fraudulent behaviour may cause failing the course for a whole academic year. An internal dossier of these activities will be built and, when reoffending, the university rectorate will be asked to open a disciplinary record

Sources of information

Basic Bibliography

Young, Freedman, **Física Universitaria**, 978-6073244398, Pearson, 14ª ed., (2 vols.), 2018
R. A. Serway y J.W. Jewett, **Física para Ciencias e Ingeniería**, Thomson, 9ªEd., 2014

Complementary Bibliography

P.A. Tipler y G. Mosca, **Física para la Ciencia y la Tecnología**, Reverté, 6ª ed., (2 vols.), 2010
Jou, Llebot, Perez, **Física para ciencias de la vida**, McGraw-Hill, 2ª ed., 2008
R.A. Varela y G. Rosón, **Métodos en Oceanografía Física**, Edit. Anthias, 2008
W.E. Gettys, F.J. Keller y M.J. Skove, **Física clásica y moderna**, McGraw-Hill, 1992
A. H. Cromer, **Física para las ciencias de la vida**, Editorial Reverté, Barcelona., 1986

Recommendations

Subjects that continue the syllabus

Physical oceanography I/V10G060V01503

Subjects that it is recommended to have taken before

Physics: Physics I/V10G061V01102

Other comments

The continued use of tutorials is recommended to solve any doubt about the subject, and also to help solve the problems.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

The methodologies based on the master class, seminars and laboratory practices are maintained.

* Teaching methodologies modified

In the scenario 1) face-to-face teaching and face-to-face on line (mixed) or 2) online teaching (virtual) the referred methodologies will carry out by the Integra Campus and the Remote Campus, respectively.

* Non-attendance mechanisms for student attention (tutoring)

In the scenarios 1 and 2, student attention will be carried out through the Remote Campus in the virtual office of the teachers and/or the exchange of emails.

* Modifications (if applicable) of the contents

Not applicable.

* Additional bibliography to facilitate self-learning

Not applicable.

* Other modifications

Not applicable.

=== ADAPTATION OF THE TESTS ===

If scenario 1 and /or 2 occurs, the assimilation of knowledge and competences by the students will be evaluated with the same evaluation systems, in terms of the final exam, it will be carried out through the Remote Campus.
