Course guide
280601 - 280601 - Physics

Unit in charge:	Barcelona School of Nautical Studies
Teaching unit:	748 - FIS - Department of Physics.

Degree: BACHELOR'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010). (Compulsory subject).

Academic year: 2025   **ECTS Credits:** 9.0   **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: ANTONIO ISALGUE BUXEDA

Others: Primer quadrimestre:
ANTONIO ISALGUE BUXEDA - GNTM1, GNTM2
SERGIO MASSIP ALVAREZ - GNTM1, GNTM2

Segon quadrimestre:
ANTONIO ISALGUE BUXEDA - GNTM
SERGIO MASSIP ALVAREZ - GNTM

REQUIREMENTS

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DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
2. Understanding and mastering the basics of the general laws of mechanics, thermodynamics, fields and waves and electromagnetism and their application to problem solving pro principles of engineering.

Generical:
1. ABILITY TO IDENTIFY AND SOLVE PROBLEMS IN THE FIELD OF ENGINEERING

TEACHING METHODOLOGY

Receive, understand and synthesize knowledge
Put out and solve problems and questions related to the subject
Develop reasoning and critical thinking, pose it and defend, in written or oral
Perform an individual work
Perform work in a reduced group.
These can be done in person, or with documental, CIT, digital campus, chat, video and videoconference support, following the norms of the University and the Center in each case.

LEARNING OBJECTIVES OF THE SUBJECT

Understand and dominate the basic concepts about general laws of mechanics, thermodynamics, fields and waves, and electromagnetism.
To apply fundamental concepts about physics principles in engineering problems.
Correctly pose the problems from the proposed statements and identify the options for their resolution. Apply the appropriate resolution methods. Carry out the tasks assigned in the time provided, in accordance with the guidelines set by the teacher or tutor.
Identify progress in understanding and knowledge, and the degree of fulfillment of learning objectives.

STUDY LOAD

Type	Hours	Percentage
Self study	135,0	60.00
Hours medium group	30,0	13.33
Hours large group	60,0	26.67

Total learning time: 225 h

CONTENTS

Mechanics.

Description:
Description of the movement: Cinematics. Relative movement. Coriolis and centripetal accelerations. Changes in the movement: Dynamics. Newton's laws. Statics of rigid bodies. Rotation of a solid. Introduction to the gyroscope (part of STCW A-II_1 I, and STCW A-II_2 III - Compass – magnetic and gyro Knowledge of the principles of magnetic and gyroâ□□compasses). Introduction to the mechanics of materials. Stresses in solids and in fluids. Statics of fluids, Buoyancy. Fluids in movement: Equation of continuity and Bernoulli's equation. Movement with friction and with drag. Force, velocity and power. Energy in the transport.

Specific objectives:
Understand and master the basic concepts about the general laws of mechanics.
Apply the basic physical principles of mechanics to the resolution of simple problems.
Propose and solve correctly the simple mechanical problems from the proposed statements and identify the options for their resolution.

Related activities:
Reading of chapters of books specified in the bibliography, or notes, or by means of video.
Listen to the teacher and participate in the problem-solving, in person, in video or on-line.
Solve problems individually.
Realization of three practices with simulators (computer), on relative movement, movement with friction, and stopping of boats, and deliver the reports

Full-or-part-time: 51h
Theory classes: 36h
Practical classes: 12h
Laboratory classes: 2h
Guided activities: 1h

Oscillations.

Description:
Oscillations. Simple harmonic movement. The energy of harmonic movement. Damped oscillating movement. Relaxation time and quality factor. The forced oscillations. Resonance and bandwidth.

Specific objectives:
Understand and master the basic concepts about the general laws of vibrations.
Propose and solve correctly the simple problems of oscillations from the proposed statements.

Related activities:
Read the book chapters related to the oscillations of some of the recommended bibliography books, or notes o recommended videos.
Listen to the teacher the indications on the ways to solve the simple exercises, presentially or on video, or on-line.
Perform simple exercises on oscillations, autonomously
Perform a practice with pendulums, to evaluate the value of gravity and estimate the error, and deliver the report.

Full-or-part-time: 30h
Theory classes: 24h
Practical classes: 6h

Waves.

Description:
Propagation of waves. Wave equation. Mechanical waves Examples: Waves on a rope, waves on an elastic medium, other examples. Harmonic waves. Overlap of waves. Standing waves. Interference and diffraction. Energy and waves: Density of energy and intensity. Sound. Sound pressure level. Doppler effect.

Specific objectives:
Understand and master the basic concepts about the general laws of the waves.
Propose and solve correctly the wave problems from the proposed basic statements

Related activities:
Read the chapters corresponding to waves in one of the books of the recommended basic bibliography, or in notes or on recommended videos.
Listen to the teacher's instructions on solving problems, directly, on video or on-line.
Perform three practices with a computer simulator on aspects of waves, and deliver the reports.

Full-or-part-time: 50h
Theory classes: 10h
Practical classes: 10h
Laboratory classes: 6h
Self study : 24h

(ENG) Termodinàmica i propietats tèrmiques de la matèria.

Description:
Heat, work and temperature. Thermodynamic systems. States of matter. Psychrometric diagram. Stability of the atmosphere. Introduction to heat transfer. Newton's law for the cooling of a body. Conduction, Convection and Radiation ((part of STCW AIII-2_II: Theoretical knowledge: Thermodynamics and heat transmission). Thermodynamics Principles: Zero and First principles. Adiabatic processes. Second Principle: Thermal engines and cycles. Entropy. Thermodynamic Potentials. Enthalpy

Specific objectives:
Understand and master the basic concepts about the general laws of Thermodynamics.
Propose and solve correctly the simple problems of thermodynamics from the basic statements proposed

Related activities:
Read the chapters corresponding to thermodynamics in one of the books of the recommended basic bibliography, or on notes or on recommended videos.
Listen to the teacher's instructions on solving problems, directly, on video or on-line.
Perform an experimental practice (the cooling of a body) with a digital thermometer, write the report and deliver it.

Full-or-part-time: 40h
Theory classes: 30h
Practical classes: 8h
Laboratory classes: 2h

(ENG) Electricitat i magnetisme.

Description:
Concepts of charge and electric field. Electric current. Basic laws of the electric and magnetic fields. Quasistatic magnetic field; sources and effects. Effect of the magnetic field on a magnetic moment (part of STCW A-II_1_I: Compass – magnetic and gyro. Knowledge of the principles of magnetic and gyroâ□□compasses). Electric and magnetic fields and materials. Electromagnetic induction. Generators.

Specific objectives:
Understand and master the basic concepts about the general laws of electromagnetism.
Propose and solve correctly the simple problems on the magnetic field and its interaction with electric currents and magnetic moments from the proposed basic statements

Related activities:
Read the chapters corresponding to waves in one of the books of the recommended basic bibliography, or on notes, or on recommended videos.
Listen to the teacher's instructions on solving problems, directly or on video or on-line.
Perform an experimental practice (magnetic field of a magnet and its interaction with a compass), write the report, and deliver it.

Full-or-part-time: 32h
Theory classes: 24h
Practical classes: 6h
Laboratory classes: 2h

Electromagnetic waves, light and properties.

Description:
Description of electromagnetic waves. Electromagnetic radiation and light. Measurement and properties of light. The rays of light and optics. Thermal radiation, quantization, and related phenomena.

Specific objectives:
Understand and master the basic concepts about the general laws of electromagnetic waves.

Related activities:
Read the chapters corresponding to electromagnetic waves in some of the books of the recommended basic bibliography, or on notes or on recommended videos.
Solve some problems on the subject

Full-or-part-time: 22h
Theory classes: 16h
Practical classes: 4h
Laboratory classes: 2h

GRADING SYSTEM

Practical works are mandatory (to do and to perform the deliveries). There will be two partial exams of 2 h each during the course. Assistance will be checked. To achieve a numeric final qualification (Nfinal), different from NP (not presented), the students have to have done and delivered at least the 80% of evaluable activities (Practical works + Continuous Evaluation exercises and deliveries)

Final qualification results from:
Nfinal = 0,30 Npf + 0,25 Npract + 0,45 Nparcials
(Npf = degree of final exercises; Npract= degree of practices and simulator exercices; Nparcials= degree of continuous evaluation and partial exams)

The students that do not succeed will be able, according to the norms from the University and the Center, to be re-evaluated in the dates determined by the Center. In the re-evaluation, grades on practical exercises, deliveries and other activities (Nac) will be taken into account and can be completed, presenting them at the moment of re-evaluation exercises, which will be graded as Nre. For the students who are re-evaluated, the final grade will be:
Nfinal= 0,75 * Nre + 0,25 * Npract

Nfinal: final qualification.
Nre: qualification of the re-evaluation exercises.
Npract: qualification from lab work and simulators work.

Partial exercises will span up to 2 h each.

EXAMINATION RULES.

- Practical works are mandatory (to do and to perform the deliveries).
- Non-done activities or non-delivered tasks will not be evaluated and their degree will be 0
- Not presented (NP) qualification will be assigned to students that had not done tasks valued 20% or more of the total.

BIBLIOGRAPHY

Basic:

- Alonso, M.; Finn, E.J. Física. México: Addison-Wesley Longmann, 2000. ISBN 9684444265.
- Burbano, S.; Burbano, E.; Garcia, C. Física general. 32a ed. Madrid: Tebar, 2003. ISBN 8495447827.
- Gettys, W.E.; Keller, F.J.; Skove, M.J. Física para ingeniería y ciencias. 2a ed. México: McGraw-Hill, 2005. ISBN 9701048938.
- Valiente Cancho, Andrés. Física aplicada : 192 problemas útiles [on line]. 2a ed. Madrid: García Maroto Editores, 2013 [Consultation: 29/07/2024]. Available on: https://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=3948. ISBN 9788415793182.
- Young, Hugh D.; Freedman, Roger A.; Ford, A. Lewis. Física universitaria : Sears-Zemansky. Vol. 1 [on line]. 13a ed. México D.F.: Pearson Educación, 2013 [Consultation: 23/10/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4618. ISBN 9786073221252.
- Tipler, Paul A.; Mosca, Gene. Física para la ciencia y la tecnología, Vol. 1 [on line]. 6a ed. Barcelona: Reverté, 2010 [Consultation: 01/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=10372. ISBN 9788429144291.
- Giancoli, Douglas C. Física: principios con aplicaciones, Vol. 1 [on line]. 6a ed. México: Pearson Educación, 2009 [Consultation: 01/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1283. ISBN 9786074429831.
- Tipler, Paul A.; Mosca, Gene. Física para la ciencia y la tecnología, Vol. 2 [on line]. 6a ed. Barcelona: Reverté, 2010 [Consultation: 01/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=10373. ISBN 788429144307.
- Giancoli, Douglas C. Física: principios con aplicaciones, Vol. 2 [on line]. 6a ed. Méxcio: Pearson Educación, 2010 [Consultation: 01/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1284. ISBN 9786074429824.

Complementary:

- Cutnell, J.D.; Johnson, K.W. Física. 2a ed. México: Limusa-Wiley, 2004. ISBN 9681864514.
- González, Félix A.. La Física en problemas. Madrid: Tebar Flores, 1995. ISBN 8473601416.
- Resnick, R.; Halliday, D.; Krane, K. Física. 4a ed. México: CECSA, 2002. ISBN 9702402573.
- Wilson, J.D.; Buffa, A.J.; Lou, B. Física. 5a ed. México: Pearson educación, 2003. ISBN 9702604257.
- Blatt F.J. Fundamentos de física. 3a ed. México: México [etc] : Prentice-Hall Hispanoamericana, 1991. ISBN 9688801933.

RESOURCES

Audiovisual material:

- opencourseware MIT - Physics - https://ocw.mit.edu/search/?d=Physics&s=department_course_numbers.sort_coursenum. Theoretical explanations and visual examples, problems and questions