

Course guide

280591 - 280591 - Environmental Physics

Last modified: 01/07/2026

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

Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2026 **ECTS Credits:** 3.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: Antonio Isalgue Buxeda

Others: Antonio Isalgue Buxeda

PRIOR SKILLS

To have succeeded in Physics and Mathematics I and II (recommended following or have completed Chemistry)

REQUIREMENTS

To have succeeded in Physics, Chemistry and Mathematics I and II (recommended following or have completed Chemistry)

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. Or 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 the points where Physics is determinant and conditions aspects as climate change, relation the use of natural world with pollution and its dispersions, Energy terms at global scale, and measures to reduce the rate of degradation of world
- Understand basic phenomena implied in climatic change
- Be able to perform basic computations on renewable energy systems, and their life cycle.

(includes competences CG2, CB10, CB6, CB8 and partially CB7, CB9 and CE10)

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	40.00
Self study	45,0	60.00

Total learning time: 75 h

CONTENTS

Physics and Ambient

Description:

Ambient Physics: Matter, Energy and Information. Actual state and Energy use. Energy and contamination. Lyfe cycle and real cost

Specific objectives:

Information about approximate values of energy use and resources' use. Energy and pollution during the lyfe cycle of systems, and its real cost.

Related activities:

Description and look after references.
Elaboration of a practical synthesis

Full-or-part-time: 4h 30m

Theory classes: 2h

Self study : 2h 30m

Pollution and difusion of matter (polluants)

Description:

Difusion: Fick's law.
Significance of advection.
Difusion in air and in water.

Specific objectives:

Comprehension of Fick's law relevance on dispersion of pollutants, and also the relevance of advection

Related activities:

Revise difussion particularities
Perform numerical computations for actual pollutant dispersion in a simple case

Full-or-part-time: 14h

Theory classes: 6h

Self study : 8h

Climatic aspects, greenhouse gases and particulates in the atmosphere

Description:

Greenhouse effect and CO₂ emissions. Other greenhouse gases. The effect of particulate matter in the atmosphere. Geoengineering.

Specific objectives:

Greenhouse effect in the atmosphere. Greenhouse gases
Other relevant phenomena
Future projections and Geo-Engineering

Related activities:

Description and quantification of greenhouse effect. Efficiency of the greenhouse gases
Basic computations

Full-or-part-time: 14h

Theory classes: 6h

Self study : 8h

Renewable energies

Description:

Renewable energy sources

Specific objectives:

Solar Energy: Thermal and Photovoltaic

Solar purification of water

Eolic Energy

Hydroelectric Energy

Geothermal Energy

Wave Energy, tidal Energy

Related activities:

Description and basics of different systems

Basic design computations

Full-or-part-time: 19h

Theory classes: 7h

Self study : 12h

Introduction to nuclear Physics

Description:

Nuclear reaction (fission and fusion)

Characterization of risks: Nuclear radiation and active nuclear residues

Specific objectives:

Concept of fission and fusion reactions

Control of the reactions

Available energy

Risks. Nuclear radiation and its characterisation.

The problem of nuclear residues.

Full-or-part-time: 8h

Theory classes: 4h

Self study : 4h

Fossil energy sources

Description:

Fossil energy sources revision

Specific objectives:

To compare the relevance of fossil fuels energy use and total requirements

Related activities:

Data and information search

Basic calculations, future extrapolation, and climate change variabilities

Full-or-part-time: 4h 30m

Theory classes: 2h

Self study : 2h 30m



Energy storage

Description:

Actual energy storage systems

Specific objectives:

To describe working principles and performance of actual energy storage systems

Related activities:

Basic computation of resources needed to store energy for practical concrete uses

Full-or-part-time: 6h

Theory classes: 3h

Self study : 3h

GRADING SYSTEM

40% Written exercise, 20% Oral exposition of work performed by the students, 10% Written work, 30% Continuous evaluation and following of course.

EXAMINATION RULES.

Works or tests not done will correspond to a qualification of 0. It is needed to do more than 80% of activities to obtain a valid numerical qualification of the subject.

BIBLIOGRAPHY

Basic:

- Boeker, Egbert ; Grondelle, Rienk van. Environmental physics. 2nd ed. Chichester, UK: John Wiley and Sons, 1999. ISBN 0471997803.
- Malder, Karl (ed). Desarrollo sostenible para ingenieros [on line]. Barcelona: Edicions UPC, 2007 [Consultation: 06/07/2026]. Available on: <https://hdl.handle.net/2099.3/36831>. ISBN 9788483018927.

Complementary:

- Fullana i Palmer, Pere; Puig, Rita. Análisis del ciclo de la vida. Barcelona: Barcelona, Rubes, 1997. ISBN 8449700701.
- Petroski, Henry. To engineer is human: the role of failure in succesful design. New York: Vintage Books, 1992. ISBN 9780679734161.