

Academic Year/course: 2021/22

25206 - Physical foundations of the environment

Syllabus Information

Academic Year: 2021/22

Subject: 25206 - Physical foundations of the environment

Faculty / School: 201 - Escuela Politécnica Superior

Degree: 571 - Degree in Environmental Sciences

ECTS: 6.0

Year: 1

Semester: Second Four-month period

Subject Type: Basic Education

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem-solving, laboratory sessions, assignments, autonomous work and study, group work and exams.

4.2. Learning tasks

This 6 ECTS course (150 hours) is organized as follows:

- **Lectures.** They include the explanation of the theory as well as problem-solving. One of the purposes of Physical Foundations of the Environment is to set the basic knowledge needed for later courses, which have a more direct connection to the Sustainable Development Goals (SDG), particularly targets 6.4 (By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity), 7.2 (By 2030, increase substantially the share of renewable energy in the global energy mix), 7.3 (By 2030, double the global rate of improvement in energy efficiency), 12.2 (By 2030, achieve the sustainable management and efficient use of natural resources), and 13.3 (Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning).
- **Laboratory sessions.** They include the presentation of the report elaborated from the results obtained.
- **Assignment.** It consists on the elaboration of an assignment related to some environmental aspects of the subject.

4.3. Syllabus

This course will address the following topics:

Lectures

Section I: Physics of Fluids

- Topic 1: Fluid Statics
- Topic 2: Fluid Dynamics

Section II: Thermodynamics

- Topic 3: Temperature and Heat
- Topic 4: First law of Thermodynamics
- Topic 5: Second law of Thermodynamics

Section III: Waves

- Topic 6: Harmonic Oscillator
- Topic 7: Ondulatory Movement

Section IV: Electromagnetism

- Topic 8: Electrostatics
- Topic 9: Electrokinetics
- Topic 10: Magnetism
- Topic 11: Electromagnetic Induction
- Topic 12: Alternating currents
- Topic 13: Electromagnetic waves

Laboratory sessions

- Exercise 1.- Mechanics of solids and fluids
 - a. Expansion of solids.
 - b. Solving/checking the basic equation of fluid statics and the Archimedes' principle. Measuring the density of a cylinder.
 - c. Measurement of average speed of fluids using the continuity equation.
 - d. Proving Bernoulli's Principle.
 - e. Measuring speeds in turbulent liquids.
- Exercise 2.- Calorific Energy
 - a. Determining the heat capacity of a calorimeter.
 - b. Determining the specific heat (capacity) of liquids.
 - c. Determining the specific heat (capacity) of solids.
- Exercise 3.- Oscillatory and wave movements
 - a. Determining the period of a simple pendulum for small and large oscillations.
 - b. Determining the frequencies corresponding to the first four harmonics in a rubber, when it vibrates under constant elastic tension.
 - c. Determining the 2nd harmonic in a rubber, varying the elastic tension, when it is vibrating with a constant frequency.
- Exercise 4.- Ohm's Law. Association of Resistors.
 - a. Resistant measurement and the calculation of error.
 - b. Graphic representation of Ohm's Law.
 - c. Determining the voltage distribution in a series circuit.
 - d. Determining current and power distributions in a parallel series circuit.
- Exercise 5- Charging and discharging a capacitor in an RC series circuit
 - a. Varying the intensity and voltage according to timing
 - b. Determining the relaxation time of a circuit

4.4. Course planning and calendar

Information concerning the timetable, office hours, assessment dates and other details regarding this course will be provided by the lecturer on the first days of class.

Type activity / Week	1	2	3	4	5	6	7	8	9	10	11	12 (1)	13	14	15	16	17	18	19	20	21	Total	
<i>Synchronous activities</i>																							60
Theory	2	2	2	2	2	2	2	2	2		2	1	1	2	2	1							27

Problems	2	2		2				2	2		2		2	2		2						18
Lab sessions			2		2		2					2			2							10
Group work						2						2				1						5
<i>Non-synchronous activities</i>																						90
Individual work	4	4	4	2	2	2	4	2	4	6	2	3	3	4	2	2	6	6	6	6		74
Group work				2	2	2		2			2		2		2	2						16
TOTAL	8	8	8	8	8	8	8	8	8	6	8	8	8	8	8	8	6	6	6	6	0	150

(1) Wednesday 27th April will have Monday-schedule

4.5. Bibliography and recommended resources

- BB** BURBANO DE ERCILLA, S.; BURBANO GARCÍA, E.; GRACIA MUÑOZ, C. Problemas de física general. 26ª ed. [s. l.]: Mira Editores, 1994.
- BB** BURBANO DE ERCILLA, S.; BURBANO GARCÍA, E.; GRACIA MUÑOZ, C. Problemas de física. Tomo 2. Campo gravitatorio, elasticidad, termodinámica, transferencia de calor, movimientos ondulatorios y electromagnetismo. 27ª ed. [s. l.]: Tébar, 2006.
- BB** Burbano de Ercilla, Santiago. Física general / Santiago Burbano de Ercilla, Enrique Burbano García, Carlos Gracia Muñoz . 32ª ed. Madrid : Tébar, D.L. 2003
- BB** Español Garrigós, Pep. Bases físicas del medio ambiente / Pep Español, Javier García Sanz, Ignacio Zúñiga . 1ª reimp. Madrid : UNED, 2004 (reimp.2005)
- BB** Jaque Rechea, Francisco. Bases de la Física Medioambiental / Francisco Jaque e Íñigo Aguirre de Cárcer . Barcelona : Ariel , 2002
- BB** Problemas y cuestiones de física / Atanasio Lleó...[et.al] . Madrid [etc] : Mundi-Prensa, 2002
- BB** TIPLER, P. A. et al. Física para la ciencia y la tecnología. Apéndices y respuestas. 6ª ed. [s. l.]: Reverté, 2010.
- BB** Tipler, Paul A.. Física para la ciencia y la tecnología. Vol. 1, Mecánica , oscilaciones y ondas, termodinámica / Paul A. Tipler, Gene Mosca ; [coordinador y traductor José Casas-Vázquez ; traductores Albert Bramon Planas ... et al.]. - 6ª ed. Barcelona : Reverté, D.L. 2010
- BC** Física universitaria / Francis W. Sears ... [et al.] ; contribución de los autores, A. Lewis Ford ; traducción, Roberto Escalona García ; revisión técnica, Jorge Lomas Treviño ... [et al.] . 11ª ed. México : Pearson Educación, cop. 2004
- BC** Gettys, W. Edward. Física para ciencias e ingeniería / W. Edward Gettys, Frederick J. Keller, Malcolm J. Skove ; traducción, Luis Arizmendi López, José A. García Sole, Carlos E. Zaldo Luezas ; revisión técnica, Ángel Hernández Fernández, Sergio Saldaña Sánchez, María del Carmen Enriqueta Hano Roa. 2a ed. México : McGraw Hill Interamericana, cop. 2005
- BC** González, Félix A.. La física en problemas / Félix A. González . Nueva ed. actualizada Madrid : Tébar Flores, D.L. 2000
- BC** Serway, Raymond A. Física para ciencias e ingeniería / Raymond A. Serway, Robert J. Beichner . 5ª ed. México [etc.] : McGraw-Hill, cop. 2002
- BC** Smith, C. (2001). Environmental physics. London: Routledge
- BC** Spiegel, Murray R.. Manual de fórmulas y tablas matemáticas : 2400 fórmulas y 60 tablas / Murray R.

Spiegel ; traducción y adaptación Orlando Guerrero Ribero . [1a ed. en español, reimp.] Madrid [etc] : McGraw-Hill, imp. 2003

BC Tipler, Paul A.. Física para la ciencia y la tecnología. Vol. 2, Electricidad y magnetismo, luz / Paul A. Tipler, Gene Mosca ; [coordinador y traductor José Casas-Vázquez ; traductores Albert Bramon Planas ... et al.]. 6ª ed. Barcelona : Reverté, D.L. 2010

The updated recommended bibliography can be consulted in: <http://psfunizar10.unizar.es/br13/egAsignaturas.php?id=10969>