Universitat Autònoma de Barcelona

2023/2024

Physics for Geology

Code: 101041
ECTS Credits: 10

Degree	Type	Year	Semester
2500254 Geology	FB	1	A

Contact

Name: Enric Menendez Dalmau

Email: enric.menendez@uab.cat

Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Maria Gisbert Alcantud

Anna Campoy Ordaz

Albert Griera Artigas

Prerequisites

In case the student has not taken physics in high school, it is highly recommended that he/she follows the physics propaedeutic course offered by the faculty. In any case, it is highly advisable that the student reviews his/her previous knowledge on general physics.

A basic knowledge of mathematics at high school level is assumed and it is recommended that the student reviews the concepts of derivative and integral, basic operations with vectors and trigonometry.

In no case, the fact of not having studied physics at high school will be a reason for exemption from determining the contents of the subject, or for lowering the objectives to be achieved, since this circumstance has already been considered in the design of the subject and previous specialized knowledge will not be assumed.

Objectives and Contextualisation

This subject should serve to achieve and consolidate a basic knowledge on general physics that will be necessary to feature other subjects of the Degree.

Objectives of the course

1) To know the physical magnitudes, their units and how they are measured

2) To know how to describe mathematically the basic physical phenomena

3) To know how to apply the physical concepts and formulas to simple problems and how to solve them

4) To know how to apply physical concepts to geological contexts

Competences

- Learn and apply the knowledge acquired, and use it to solve problems.
- Synthesise and analyse information critically.
- Use concepts from physics when solving problems in geology.
- Work independently.

Learning Outcomes

1. Describe the basic physical phenomena.
2. Identify key points in problems and design strategies to solve them.
3. Interpret mathematical results and critically compare them with experimentation and observation.
4. Learn and apply the knowledge acquired, and use it to solve problems.
5. Relate the basic physical phenomena to geological processes and the dynamics of the Earth.
6. Solve both defined and open problems.
7. Synthesise and analyse information critically.
8. Use mathematics to describe the physical world, constructing suitable models.
9. Work independently.

Content

The content has been divided into ten chapters (five per semester) with a teaching load of 1 ECTS each.

First semester:

1) Mechanics

- Physical quantities. International system of units.
- Motion in one and two dimensions
- Uniform movement, uniformly accelerated movement, uniform circular movement
- Forces and Newton's laws
- Impulse and linear momentum

2) Energy and work

- Work in one and three dimensions
- Kinetic and potential energy
- Conservation theorems
- Power

3) Mechanics of solids

- Rigid solid: rotations
- Angular momentum
- Stresses and deformations. Elasticity.

4) Fluid Mechanics

- Hydrostatics
- Hydrodynamics
- Flotation
- Viscosity and turbulence

5) Heat

- Kinetic theory of gases
- Heat and heat capacity, latent heat
- Principles of thermodynamics
- Temperature and thermometers
- Triple point and critical point
- Mechanical equivalence - heat
- Dilatation. Changes of state.

Second semester:

6) Waves

- Harmonic vibratory motion: period and frequency
- Waves. Wave propagation in an elastic medium.
- Wave motion
- Wave phenomena: interference and diffraction

7) Electric field and electric current

- Electric charge
- Electric field. Gauss's law.
- Electric current. Elementary circuits.

8) Electromagnetism

- Magnetism. Magnetic field.
- Magnetism in the earth
- Electromagnetic induction

9) Optics

- Nature of light
- Geometrical optics
- Physical optics: reflection and refraction of light

10) Radioactivity and structure of matter.

- Structure of matter: atoms and nuclei
- The structure of the atomic nucleus: the isotopes
- Radioactivity
- Sources of radiation

Each chapter includes applications to geology-related topics, such as: Earth's gravitational field, gravimetric anomalies, Kepler's laws of planetary and satellite motion, seismic waves, terrestrial magnetism, radioactive minerals, and geological dating, etc.).

Methodology

There will be three types of learning activities:

1) Guided learning activities

a) Theory classes. On average, two hours a week are devoted to theory classes, with computer support, in which the basic points of the program are presented, complementary readings are suggested, and the questions that students can ask are addressed. Some of these hours are taught by a professor of the Department of Geology in the form of a seminar, who will present applications from physics to geology. The PowerPoints of the classes will be available to students through the UAB Virtual Campus.

b) Classes of problems. Students will carry out on average one hour a week of problems. The statements of the problems are known by the students in advance thanks to the Virtual Campus, and, in the class, the participation of the students in its resolution will be encouraged. The proposed tasks will be collected and evaluated.

c) Demonstrations. Some theory hours will be devoted to demonstration activities in the classroom in small groups. They will usually be small experiments (real or virtual) that will be carried out with the participation of the teacher and the students themselves. Some hours will also be devoted to personalized tutorials aimed at groups of students with different level of physics background.

NOTE: Attendance to classes (theory, seminars, problems, and demonstrations) is mandatory and will be monitored. Repeating students, however, have the option of taking only the final global synthesis test. Any other circumstances that prevent normal class attendance should be discussed with the teacher as soon as possible.

2) Supervised learning activities

Throughout the course, problems and exercises (compulsory) will be delivered, which will be collected and evaluated by the teachers. Various problem-solving activities or questionnaires will also be opened in the Moodle of the subject that the students will have to answer and that will also be evaluated.

3) Autonomous learning activities

The student must be aware of the need for individual study of the proposed topics. Students will have class slides on the virtual campus from the beginning of the course and it is recommended that they look at them before each class.

Note: 15 minutes of a class will be reserved, within the calendar established by the center, for students to complete the surveys for evaluating the performance of teachers and evaluating the subject/module.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Class of problems	28	1.12	7, 2, 3, 6, 8
Seminars	8	0.32	5, 6
Theory classes	56	2.24	1, 3, 5, 8
Type: Supervised			
Delivery of resolved problems	23	0.92	7, 2, 3, 5, 6, 9
Type: Autonomous			

Individual student work	125	5	4, 1, 3, 5, 9

Assessment

Learning activities will be assessed based on continuous evaluation. There will be two types of assessment activities: (A) individual written tests and (B) monitoring of the student's portfolio.

A) Individual written tests. They will represent 70% of the final grade of the subject. There will be four individual tests, at the end of the various topics. These written tests will include both the theoretical part and the solution of exercises and problems. Attendance at the tests is mandatory and failure to appear in any of them will be scored with no attendance.

B) Monitoring of the student's portfolio. The remaining 30% of the grade will include reports of the activities carried out in the problem classes and seminars and the results of the tasks carried out remotely using the Moodle platform. (All these tasks are mandatory and failure to submit to any of them will be scored with no attendance).

In order to pass the course, it is mandatory to have a note of all the evaluable activities.

The result of the combined assessment of sections A) and B) will be the final grade of the course.

In the event that the student has taken all the assessment activities and has not passed the course, he/she will be able to take the final recovery test (global synthesis test over the whole course) which will replace the grade of section A) and, therefore, will account for 70% of the final grade, and the value of the grade of section B) (the remaining 30%) is maintained in all cases. Optionally, it will be possible to recover (as long as the student has previously presented in all the individual written tests) one of the individual tests in section A) on the day of the final recovery test, replacing their respective results in the calculation of the final note of the subject.

In the case of second or higher enrollment, it is necessaryfor the student to follow the continuous assessment, under the same conditions as first-year students.

A student who has completed any of the subject's assessment activities cannot be listed as "not presented".

In this subject, there is no single assessment option.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Individual written tests	0,7	6	0.24	1, 3, 5, 6, 8
Reports of resolved problems and supervised activities	0,3	4	0.16	7, 4, 2, 6, 9

Bibliography

Books:

1) Tipler, Paul A. Física Preuniversitaria. (2 vol.) Ed. Reverté

2) Tipler, Paul A. Física para la ciencia y la tecnología. Ed Reverté

3) Enciso Pizarro, Juan. Física (SCHAUM) McGraw-Hill

4) Chapman, Richard E. Physics for Geologists. Ed. Routledge

Software

No specific program is required.