COURSE DATA

Data Subject	
Code	33086
Name	Continental and marine hydrology
Cycle	Grade
ECTS Credits	4.5
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1104 - Degree in Environmental Sciences	Faculty of Biological Sciences	2	First term

Subject-matter

Degree	Subject-matter	Character
1104 - Degree in Environmental Sciences	124 - Marine and continental hydrology	Obligatory

Coordination

Name	Department
RENAU PRUÑONOSA, ARIANNA	356 - Botany and Geology

SUMMARY

The continental and marine hydrology course forms part of the CC.AA (Environmental Sciences) degree and has a direct and close relationship with environmental issues as a natural science. The course consists of two clearly separated parts as they are two disciplines within the Earth Sciences with contents and methods of study and research well differentiated, although the common element that joints them is “the water”. The part corresponding to surface hydrology is connected to the nature and structure of geological materials. In physical processes (fluid mechanics) and chemicals (reactions between water and rock minerals). In this sense the subject exposes the presence of water in geological enviroments, the relationship with them, the geochemistry derived from this relationship and in relation to its meaning as natural resource, the issues derived from the impact on its exploitation or anthropic activities that could influence their degradation. Regarding the marine environment, this subject links the emerged and submerged reliefs, compare the physical and chemical characteristics of the sea water and relate the factors and processes that determine the development of the different species of organisms in the marine environment. It also introduces the study of the importance of the conservation of biodiversity and marine protected areas and the use of energy resources derived from marine dynamics.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Required have taken the Geology course (Code 33079)

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1104 - Degree in Environmental Sciences

- Have capacity for analysis and synthesis and for critical reasoning.
- Be able to communicate orally and in writing.
- Be able to learn independently and to adapt to new situations.
- Be able to work in a team.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

Is intended to achieve the following objectives:
- Knowledge of the chemical principles related to the geochemistry of the rocks in the natural environment.
- Know the physicochemical mechanisms that provide the chemicals to groundwater.
- Identification and description of the main types of rocks and recognition of physicochemical properties of the different layers of the Earth.
- Evaluation and interpretation of geological information about the terrain and geological maps (stratigraphy, structures, and graphs).
- Identify different seafloor relay related to the dynamics of the crust.
- Identify the different types of materials in the deep ocean, its composition and origin.
- Know the physical and chemical properties of sea water, its variations * latitudinals and depth.
- Know the relay coastal marine dynamics determined by both the coasts with cliffs and in the sand.
- Main groups of organisms and their adaptation to coastal marine dynamics, with special mention of these on the shores of the Mediterranean.

DESCRIPTION OF CONTENTS

1. BLOCK 1: CONTINENTAL HIDROLOGY (Surface and groundwater)

Topic 1. Hydrosphere. Water in nature. The water cycle. Precipitation Evapotranspiration. Surface runoff. Infiltration. Surface water. Groundwater

Topic 2. Surface hydrology. The importance of surface water at different scales. Lotic waters (rivers) and lentic waters (lakes). Watersheds. Hydrograms Extreme events: Floods and droughts.

Topic 3. Water in geological formations. Importance of groundwater at different scales. Unsaturated zone. Saturated zone Porosity. Types of aquifers. Energy status: piezometry. Direction of the flow. Darcy's Law (permeability, transmissivity, saturated thickness and hydraulic gradient). Storage coefficient. Groundwater-surface water relations. Springs Flow models. Hydric balance.

Topic 4. Hydrogeochemistry and pollution. Hydrochemistry and hydrogeochemistry. Water: components and characteristics. Chemical characteristics of groundwater. Transport and mass transfer. Pollution of agricultural, industrial and urban origin. Salinization.

Topic 5. Acquisition and data processing in Hydrogeology. Field techniques. Piezometric maps. Pumping tests. Sampling and analysis. Representation techniques (ionic relations, diagrams). Statistical techniques (cluster, multivariate analysis). Mathematical models of flow.

Topic 6. Water management. Reservations and resources. Exploitation and overexploitation. Vulnerability of aquifers. Decontamination of aquifers. Water footprint and virtual water. Protection perimeters. Desalination. Artificial recharge Legislation. The water in the Valencian Community.

2. BLOCK 2: OCEANOGRAPHY (MARINE HYDROLOGY)

7. Disciplines and background. Importance of the oceans. Disciplines. Marine geology. Marine biology. Physical or descriptive oceanography. Marine chemistry. Background.

8. Origin and formation of the oceans (Marine geology). Formation of the oceans. Current oceans. Continental drift and relief of the ocean basin Techniques and methods of study in marine geology.

9. Seabed sediments (Marine geology). Origin and classification of sediments. Sediment distribution.

10. Water and salinity of the oceans (Marine chemistry). Composition of ocean water. Processes that control salinity. Distribution of salinity.

11. Physics of the oceans (physical or descriptive oceanography). Sunlight. Temperature. Pressure. Density and viscosity. Sound propagation.

12. Waves (physical or descriptive oceanography). Characteristics. Shallow and deep waves. Approach to the coast and rupture. Waves generated by wind, Fletch and sea in the background. Wave interference. Types of waves: dry, tsunamis (seismic waves), internal.

13. Tides (physical or descriptive oceanography). Origin. Tidal equilibrium theory. Types of tides. Tidal ranges. Dynamic theory of tides. Diurnal, semi-diurnal and mixed tides. Quotidal lines and amphidromic points. Tidal waves.

14. Marine currents (physical or descriptive oceanography). Surface currents. Geostrophic currents. Influence of currents on climate. Upwelling/downwelling and pycnocline. Antarctic circulation. North and south Atlantic circulation. Pacific circulation. Circulation of the Indian Ocean. Arctic circulation. Global

Circulation.

15. Current State of the Oceans

3. HYDROGEOLOGY / OCEANOGRAPHY PRACTICES

Rocky coasts: Genesis of the relief. Morphology of the cliff coast. Erosion and sedimentation processes. Adaptations to hard substrates, measurement of physical and chemical parameters. Recent natural processes and evaluation of the environmental impact on coastal organisms.
- Coastal Practice. Coastal Classification according to Shepard. Primary costs, secondary costs. Form of the coasts. Beaches. Coasts formed by biological activity. Estuaries

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	24,00	100
Laboratory practices	18,00	100
Tutorials	3,00	100
Development of individual work	15,00	0
Study and independent work	15,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	**110,00**	

TEACHING METHODOLOGY

The knowledge that students must acquire in this course will get them throughout the course by developing various activities, such as:
• Lectures
• Labs
• Field practices
• Video projection
• Reading books
• Tutoring

EVALUATION

The subject consists of 2 distinct PARTS.

PART 1: consists of two parts.

A) Theory and practices of Continental Hydrology. The knowledge acquired through a written exam will be evaluated.

B) Theory of Marine Hydrology. The knowledge acquired through a written exam will be evaluated.

PART 2: consists of two parts.

A) Coastal Classification Work. The knowledge acquired will be evaluated by carrying out a written work.

B) Field trip. The knowledge acquired in the field will be evaluated in a written exam that will be carried out in the same field trip.

To pass the subject, the mark of each PART must be at least 5 points out of 10. Within a PART, the marks can be compensated, as long as the mark is higher than 4.5 (out of 10). In this case it will be "approved by compensation", maximum 5 points.

Once PART 2 has been passed (both Coastal Work and Field trip), this note is saved for successive calls, although these are from different academic years.

REFERENCES

Basic

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Custodio E, Llamas MR (2001). Hidrología Subterránea. Segunda edición. Ediciones Omega. ISBN:84-282-0446-2

Morell I, Renau-Pruñonosa A (2019). Contaminación de aguas subterráneas. Algunos ejemplos. (Groundwater pollution. Some cases studies). Revista Enseñanza de las Ciencias de la Tierra, 27 (1). ISSN: 1136-9157

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GLEICK, P.H. (1993): Water in Crisis: a guide to the world's fresh water resources. New York, Oxford University Press, 473 p.

HOFRICHTER, R. 2004. El Mar Mediterráneo. Omega, Vol. I, 592 pp. y II, 849 pp.

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