VNIVERSITAT DE VALÈNCIA

Course Guide

33086 Continental and marine hydrology

COURSE DATA

DATA SUBJECT

Code: 33086
Name: Continental and marine hydrology
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1104 - Degree in Environmental Sciences	Facultat de Ciències Biològiques	2	First quarter

SUBJECT-MATTER

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

COORDINATION

RENAU PRUÑONOSA ARIANNA

SUMMARY

The subject of Continental and Marine Hydrology is part of the content of Environmental Sciences Degree and has a direct relationship with environmental problems. The subject consists of two parts framed within the Earth Sciences, the common thread being natural water. Both Continental and Marine Hydrology use differentiated study and research methods, although each part is independent of the other.

The part corresponding to Continental Hydrology is explained, and understood, based on the nature and structure of geological materials, which contain and distribute surface and groundwater, in which physical processes (fluid mechanics) and chemical processes (reactions between water and minerals in rocks) have a very important weight. In this sense, the subject exposes the presence of water in geological environments, the relationship with these environments, the geochemistry derived from this relationship (water-rock). In addition, emphasis is placed on its management (sustainable natural resource), issues arising from the impact on its exploitation or with anthropogenic activities that could influence its degradation and recovery.

Regarding the marine environment (Marine Hydrology), the aim is to relate the factors and characteristics that give rise to the current distributions of water in the oceans and seas today. These characteristics are the emerged and submerged relief, the physical and chemical characteristics of seawater and the relationship between the main factors (temperature, salinity and density), as well as understanding the

different mechanisms of water and sediments distribution.

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 / LEARNING OUTCOMES

1104 - Degree in Environmental Sciences

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.

Have capacity for analysis and synthesis and for critical reasoning.

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. Hydrological reserves. Ecological flows.

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

Topic 4. Hydrogeochemistry and pollution. Hydrochemistry and hydrogeochemistry. Mineralization of water. Water pollution. Salinization. Marine intrusion.

Topic 5. Data acquisition and processing in Hydrogeology. Field techniques. Piezometric and isocontent maps. Pumping tests. Representation techniques. Calculation, graphic, and statistical techniques.

Topic 6. Water management. Floods and droughts. Exploitation and overexploitation. Vulnerability of aquifers. Decontamination of aquifers. Water footprint and virtual water. Protection perimeters. Artificial recharge. Unconventional resources.

2. BLOCK 2: OCEANOGRAPHY (MARINE HYDROLOGY)

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

Hydrogeology:
- Preparation and interpretation of piezometric maps. Porosity. Permeability. Darcy's experience. Scale representation of flow and transport mechanisms.

Oceanography:
- Cliff 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 environmental impact assessment on coastal organisms.
- Practice of Costs. Classification of Coasts according to Shepard. Primary Coasts, Secondary Coasts. Form of costs. Beaches. Coasts formed by biological activity. Estuaries.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	24,00
Laboratory	18,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	15,00
Preparation of lessons	20,00
Preparation for assessment activities	15,00
Resolution of case studies	0,00
Total hours	**65,00**

TEACHING METHODOLOGY

The knowledge that the student has to acquire in this subject will be achieved throughout the course through the development of different activities, such as:
•Lectures
• Laboratory practices
• Theoretical and practical exams

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

- Appelo C.A.J. and Postma, D. (2005). Geochemistry, Groundwater and Pollution. Ed. Balkema. 2º ed.
- 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
- Pulido Bosch A (2007). Nociones de hidrogeología para ambientólogos. Editorial Universidad de Almería. ISBN 9788482408408 Ward AD, Trimble AW (2003). Environmental hydrology. Second edition. Lewis publishers. ISBN 1-56670-616-5
- DAVIS, R.A. (1991): Oceanography. An introduction to the Marine Environment. Dubuque (USA): Wm. C. Brown Pub., 434 p.
- DUNNE, T.; LEOPOLD, L. B. (1978): Water in Environmental Planning. San Francisco, Freeman and Comp., 818 p.
- 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.
- MARGALEF, R. (Direc,) 1989. El Mediterráneo Occidental. Omega. 374 p. Grant Gross, M. and Gross, E. (1995). Oceanography. Prentice Hall 496 p.