Universitat Autònoma de Barcelona

Hydrology

Code: 106768
ECTS Credits: 6

2024/2025

Degree	Type	Year
2504604 Environmental Sciences	OB	2

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Although there are no official prerequisites, it is advisable for the student to review the basic knowledge about Geology Fundamentals of the first year of the Degree

Objectives and Contextualisation

This course has been designed to provide Environmental Sciences students with basic and applied knowledge about the natural dynamics of the hydrogeological environment and its relationships with surface waters.

The course will address only the most fundamental and applied topics related to water and hydro-environmental dynamics, intentionally avoiding those methods, work techniques and more specific contents that would be useful from the perspective of Geology or Engineering, but not essential from the environmental perspective.

Goals:

To raise students' awareness on the "water world" and introduce them to the knowledge of the basic concepts and methodology of Surface and Underground Hydrology, applied to the resolution of environmental problems.

More specifically, it is proposed to work following two strands: on the one hand, to give basic ideas about the subject relating to principles and generic formulations, on the other hand, to specify these approaches in examples at local and regional scale.

At the same time, the aim is to place the students in front of real situations, through a learning methodology that allows them to ride their professional activity with some autonomy and to earn capabilities for identifying and reaching sound diagnoses about different hydro-environmental problems.

Learning Outcomes

1. CM36 (Competence) Incorporate the use of environmental tracers or basic analytical techniques into the characterisation of specific processes of hydrology, oceanography, or pollutant dispersion.
2. CM39 (Competence) Transmit general scientific information associated with an environmental problem to a general audience appropriately.
3. KM46 (Knowledge) Identify the most important chemical and geological processes in the different environmental compartments (hydrosphere, soil and atmosphere).
4. KM47 (Knowledge) Recognise the way in which human activity has an impact on the function of physical vectors (water, soil, oceans, atmosphere) in the natural environment.
5. KM48 (Knowledge) Compare the basic principles of science (hydrology, marine sciences, climatology, soil sciences, etc.) that constitute the basis for the study of the Earth system from an environmental perspective.
6. KM49 (Knowledge) Recognise the techniques and tools for sampling, analysis and environmental tracers.
7. SM45 (Skill) Apply basic mathematical tools and models to describe the dynamics of environmental processes.
8. SM47 (Skill) Analyse changes in the physical environment caused by natural or anthropogenic action based on the data available.
9. SM48 (Skill) Apply the main stages of the analytical procedure, including the collection and analysis of samples, for the study of the physical environment.

Content

1. Introduction to environmental hydrology and water resources: United Nations Sustainable Development Goal, ensuring the availability and sustainable management of water and sanitation for all.
2. The hydrological cycle, the basin system and its interactions with the climate and anthropic action. Hydrological systems and Global change: Impacts produced by humans and climate change.
3. Surface hydrology and fluvial and coastal geomorphology. Lacustrine and lagoon systems.
4. Estimation of the water balance: precipitation, evapotranspiration and infiltration.
5. Hydrogeology: water in the subsoil and aquifers.
6. Fundamentals on hydraulics: Study of the surface and underground water motion, water head, hydraulic gradient and flow.
7. Hydrochemistry, dispersion of contaminants.
8. Conceptual hydrological models and numerical models.
9. Examples of interdisciplinary hydro-environmental problems.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Field trip	8	0.32	
Lab practices	8	0.32	

Master classes	32	1.28
Type: Supervised		
Tutorial activity	4	0.16
Type: Autonomous		
Collective work	8	0.32
Independent study activities	80	3.2

Master classes and evaluation (36h):

Theoretical knowledge will be transmitted, mainly, in the classroom through lectures, with ICT support and large group discussions. Apart from the selected bibliography, the students will have a diversified material for following the classes. These support materials on these topics will be available for the student on the virtual campus and in the Faculty of Science libraries. A significant part of these materials will be in English. Throughout the course, other virtual access support materials will be proposed to complement the bibliography included in this guide.

The knowledge on fundamentals acquired by the students will be evaluated through written tests.

Laboratory practices (8h):

The acquired knowledge will be put into practice and simple problems related to hidrology will be solved. Students will be introduced to the techniques of computational water modeling , by means of open access software and spreadsheets. Students will often need to bring their own laptop, preferably with Windows OS. Students with macOS are recommended to install a Windows emulator. It is not essential (students can share a computer in the classroom), but it will be highly recommended that everyone has their own computer. If this is not possible, students must can contact the teaching staff to find a solution.

Field trip and Collective work (8h):

The practical work focuses chiefly on the characterization of a hydrological system, in which flow relationships between surface and underground waters are stablished. The tasks will be carried out through background study, remote sensing and field work.

At the field trip, the students will familiarize with the multidisciplinary techniques of hydrological and hydrogeophysical "in situ" investigation.

The applied fundamentals acquired by the students will be evaluated through the oral defense of the their achieved results (hydro-environmentaldiagnosis based on field and laboratory work) through collective work. The delivery format will be a digital Poster, which will be defended in front of the class group.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Individual practical work	20	3	0.12	

Lab practices and collective work (reduced group)	20	1	0.04	CM36, CM39, KM46, KM47, KM48, KM49, SM45, SM47, SM48
Partial tests and remedial exam	60	6	0.24	KM46, KM47, KM48, SM45, SM47

Assessment is carried out continuously throughout the course, partly in groups and partly individually.

Individual assessement (80% of the final grade):

In this part, the scientific-technical concepts reached by the students are evaluated individually, as well as their analysis and synthesis, and critical reasoning skills.

The evaluation of the theoretical contents is carried out through 2 written tests (P1 abd P2) that are made throughout the course. The contents of each will be eliminatory (the subsequent tests do not include the contents of the previous ones). The qualification of this part is the sum of the 2 written tests (P1 - 30%, P2 - 30%) = 60%.

The other 20% remaining until completing 80% of the overall grade will correspond to resolution of practical exercices.

The qualification obtained in this individual evaluation will represent 80% of the final grade of the matter.

Collective assessement (20% of the final grade):

In this part, the work carried out by reduced groups (geophysical surveying implementation proposal) is evaluated.

The grade obtained in this collective evaluationrepresents 20% of the final grade of the matter.

The non-assessable:

It will be considered that a student will obtain the qualification of "Not Evaluable" if does not present the both works, the individual (related to the delivery of practical exercises) and the group one (related to the field trip and laboratory practices).

Retrieval exam:

Retrieval exam: about the theoretical contents of the subject evaluated in previous tests exams (P1 and P2). Students must have attended 2/3 of the assessable activities to get access to retrieval exam, when they haven't pass one or both test exams (P1 and/or P2).

Attendance:

The attendance to the theoretical classes and laboratory practices is mandatory. Unjustified nonattendance exceeding 25% rules out the student to attend the partial and final exams.

Attendance at field trips is restricted to those students who have achieved minimal attendance at theoretical classes and lab practices equal or exceeding 75%.

Single evaluation:

Thestudents taking advantageof the single evaluation must carry out the laboratory practices (PLAB) in person, must deliver the mandatory exercises, and must obtain a minimum grade of 5 points out of 10. PLAB grade will be weighted as 30% of the total grade. Attendance at the Field practice (PCAM) will also be mandatory.

The single assessment consists of a single synthesis test (with multiple choice questions and problems), on the contents of the entire theory and practice program of the subject. The grade obtained in the theoretical synthesis test will be 30% and problems 30% of the total final grade.

The single assessment test will be done coinciding with the same date scheduled for the last continuous assessment test and the same reevaluation system will be applied as for the continuous assessment.

It is necessary to grade a minimum of 5 points out of 10 in each of the parts (synthesis test, PLAB).

Bibliography

Books:

Chow, V. T., Maidment, D. R., Mays, L. W. (1988). Applied Hydrology, McGraw-Hill International editions

Custodio, E. i Llamas, M. (1976). Hidrología Subterránea

Domenico, P.A. i F.W. Schwartz (1990). Physical and chemical hydrogeology. Wiley.

Freeze, R.A i J.A. Cherry (1979), Groundwater. Prentice Hall.

Martínez Alfaro, Pedro E., Martínez Santos, Pedro, Castaño Castaño, Silvino (2006). Fundamentos de hidrogeología. . Madrid : Mundi-Prensa.

Poncev. M. (1989). Engineering hydrology. Principles and practices. New Jersey. Ed. Prentice Hall. http://ponce.sdsu.edu/330textbook_hydrology_chapters.html

Younger, P. L, (2007). Groundwater in the Environment. Blackwell Publishing.

Webs:

http://aca-web.gencat.cat/aca/appmanager/aca/aca/

Software

Does not apply

Language list

Name	Group	Language	Semester	Turn
(PCAM) Field practices	1	Catalan	first semester	morning-mixed
(PCAM) Field practices	2	Catalan	first semester	morning-mixed
(PCAM) Field practices	3	Catalan	first semester	morning-mixed
(PCAM) Field practices	4	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	1	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	2	Catalan	first semester	morning-mixed

(PLAB) Practical laboratories	3	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	4	Catalan	first semester	morning-mixed
(TE) Theory	1	Catalan	first semester	morning-mixed