Universidad Zaragoza

Academic Year/course: 2023/24

28757 - Fluvial Hydraulics

Syllabus Information

Academic year: 2023/24
Subject: 28757 - Fluvial Hydraulics
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 423 - Bachelor's Degree in Civil Engineering
ECTS: 6.0
Year: 4
Semester: First semester
Subject type: Optional
Module:

1. General information

River hydraulics has its differentiating characteristics with respect to the basic concepts of hydraulics that require a separate study for a better preparation of the student, who is used to the fact that the boundary conditions are fixed.

River hydraulics is of great importance in a country accustomed to the devastating effects of floods and this subject will enable the student to have the necessary knowledge to participate in the analysis, studies and projects related to the river from all points of view.

The student will learn the basic concepts, current trends and the most appropriate forms of design.

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the 2030 Agenda of United Nations (https://www.un.org/sustainabledevelopment/es/), specifically, the learning activities planned in this subject will contribute to the achievement of target 6.6 of Goal 6, target 9.1 of Goal 9, targets 11.3 and 11.5 of Goal 11 and target 13.1 of Goal 13.

2. Learning results

To know the basic and advanced concepts of fluvial morphodynamics

Handle the most common programs for numerical modeling of river channels in one and two dimensions To have the necessary knowledge to carry out a fluvial study

Designing the infrastructure associated with river works

3. Syllabus

Unit 1. Introduction and general concepts

Basic classification of rivers. River hydrology. Effects of reservoirs. Fluvial morphology. River ecosystem. Regulations and official documentation. Hydraulic geometry of a river. Dominant flow.

Unit 2. Hydraulics applied to rivers

Granulometry. Threshold or principle of movement. Battleship. Classification of sediment transport. Sampling and measurement. Solid flow.

Unit 3. River morphology

Mesoforms. Large-scale forms. Sand and gravel rivers. Balance of the fund. Laws of Fargue. Current on the river. Notions of sediment transport mechanics. Background transport equations. Mathematical model bases. Avenues traffic. Erosion concepts. Flow in curves. Sedimentation

Unit 4. Introduction to the works in the riverbed

Typology of works in the riverbed. Margin stabilization. Breakwater. Riprap. Gabions. Screens. Control elements of movement. Transversal and longitudinal dams. Delay structures. Stabilization of the riverbed. Protection against floods. Temporary works in riverbeds. Design of peninsulas and islands. Diversion dams. Channeling. Project flow and flood. Other effects of dams. Behavior of narrow channels.

Unit 5. Bridge Hydraulics

Historical data. Considerations on the location of a bridge. Alignment. Clear height. Optimum span. Analysis economic. Channeling works and guide dikes. Erosion calculations.

Unit 6. Hydraulic modeling in rivers

1D, 2D and 3D modeling. Theory of fluvial hydraulics models. HEC-RAS. IBER

Unit 7. Remote sensing applied to river hydraulics

What is remote sensing. History of remote sensing. Basic concepts. Landsat and sentinel. Crop calcification and determination of roughness. Flood zones.

4. Academic activities

- Generic face-to-face activities:

- Theoretical classes: theoretical concepts of the subject and illustrative practical examples to facilitate understanding.
- Practical classes: problems and case studies to complement theoretical concepts.
- Project support classes: practical classes tutored by a teacher, in small groups.

- Generic non face-to-face activities:

- Study and assimilation of the theory presented in the lectures.
- Understanding and assimilation of problems and case studies solved in practical classes.
- Preparation of practical projects.

5. Assessment system

Continuous assessment system

Individual practices. This activity will be materialized in the presentation, exposition and discussion of a work of fluvial modeling with corrections in the riverbed, in class and directed to their classmates. A minimum of 5 on 10is required.

- **Written assessment tests**: written exams scored from 0 to 10 points. The final grade for this activity will be the arithmetic mean of these tests, as long as there is no unit grade below 3.

Assessment activity	**Weighting**
Individual practices.	40 %
Written evaluation tests	60 %

Prior to the first official exam, the teacher will notify each student whether or not they have passed the subject according to the continuous evaluation system.

Global assessment system.

- Project: The student will deliver a flooding study with compensatory measures at the beginning of the test of global assessment, as a sine qua non condition to pass the subject. A minimum of 5 out of 10 is required.

- Written exam: It will consist of a test containing questions and problems related to the topics explained throughout the subject. This test will be graded from 0 to 10 points.

Assessment activity	**Weighting**
Project	30 %
Written exam	70 %

Those students who have passed the individual work but have failed the continuous assessment will only have to take the written exam.