Urban Hydrology and Flood Risk (250MEA010)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA AMBIENTAL (pla 2024)
Course	2024/25

Main teaching language at each group

- Group 10ES1 Spanish (Q1)
- Group 10ES2 Spanish (Q2)

Faculty

Responsible Faculty: Beniamino Russo
Faculty: Ernest Blade Castellet, Carles Ferrer Boix, Beniamino Russo

Objectives of Education

Plan and design advanced conventional and non-conventional solutions to face with environmental problems related to urban hydrology and flood risk management.

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	25.5 h	56.67 %
	Medium group	9.75 h	21.67 %
	Laboratory classes	9.75 h	21.67 %
	Guided Activities	0.0 h	0.00 %
Self Study		80.0 h	

Contents

Subject introduction

Introduction about the objectives, the contents and the context of the subject, explanation of the type of activities and evaluation criteria.

Flood risk management framework

Definitions of key concepts (flood hazard, exposure, vulnerability, flood risk), Legislative framework, Flood risk management framework (FRMF), classification of flood impacts.

Fundamentals of Urban Hydrology

Introduction about urban hydrology and drainage systems, key concepts in the field of sewer systems, network classification, design criteria, IDF curves and project rainfalls, estimation of hydrological losses in urban areas, models of rainfall-runoff transformation in urban catchments.

Extension of Urban Hydrology

Hydrological and hydraulic modelling of urban drainage systems, surface drainage systems and design criteria, tangible and intangible flood damages, flood depth damage curves, expected annual damage, environmental impacts, grey and blue-green infrastructures.

Sewers overflows and water quality in the receiving water bodies

Legal framework regarding water quality of the receiving water bodies, common pollutants in water quality, stormwater (SSO) and combined sewers overflows (CSO), first flush, retention tanks and other measures to reduce impacts produced by sewers overflows.

Monitoring of sewers network and receiving water bodies

Description of the most common devices and sensors to measures hydrologic / hydraulic variables (rainfall, flow depth, flow velocity, discharge) and water quality parameters.

Fluvial processes

Basic concepts of fluvial geomorphology and sediment transport. Flood propagation and flood defences.

River restoration and floods

Basic concepts of fluvial restoration principles and sediment management, e.g. dyke and dam removal, gravel replenishment

Evaluation exam

Individual exam on the theoretical and practical modules of the subject syllabus.

Theory of flood modelling

Reminder of 1D steady flow modelling, unsteady 1D and 2D modelling (equations and solvers).

Contingut Lab

Flood modelling practice

Activities

Field visit

Field visit related to subject contents.

Delivery

Report of the activity

Dedication

3h

Flood modelling practice

Introduction to flood hazard modelling in 2D, Practical classes with IBER software and its capability to model pluvial and fluvial floods in urban and peri-urban areas through the module IBER-SWMM.

Delivery

Activity report

Dedication

6h

Teaching Methodology

The subject consists of 3.0 hours per week of classroom lessons in the classroom.

They are devoted to theoretical classes, 25.5 hours, in which the teacher exposes the concepts and basic materials of the subject, presents examples and carries out exercises.

9.0 hours are spent solving problems and practical excercises with a greater interaction with the students to consolidate the general and specific learning objectives.
The rest of the weekly hours is dedicated to laboratory practices and a field visit.

Support material is shared through the ATENEA virtual campus: contents, programming of assessment activities and directed learning and bibliography.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

Grading Rules

(*) The evaluation calendar and grading rules will be approved before the start of the course.

The subject's mark is obtained from the continuous assessment grades (exam and course practice) and the one corresponding to the computer laboratory activity.

The continuous assessment consists of doing different activities, both individual and group, of acomplementary and formative nature, carried out during the course (inside and outside the classroom).

Final grade = 0.6 * Final exam + 0.05 Course practice grade + 0.35 Modelling practice

Test Rules

Failure to perform a continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

Office Hours

Prof. Beniamino Russo: Tuesday, 15.00 - 18.00, Building D1, Office 213A
Prof. Ernest Bladé: to be agreed with the professors

Bibliography

Basic

- Butler, D.; [i 3 més]. Urban drainage. 4th edition. Boca Raton: CRC Press, Taylor & Francis, 2018. ISBN 9781498750585.
- Gómez Valentín, M. Curso de hidrología urbana. Barcelona: Distribuidora Alfambra de Papelería, 2008. ISBN 9788461215140.
- Martín Vide, J.P. Ingeniería de ríos. 2a ed. Barcelona: Edicions UPC, 2006. ISBN 9788483019009.
- Gómez Valentín, M. Curso de análisis y rehabilitación de redes de alcantarillado mediante el código SWMM 5.0. Barcelona: Distribuidora Alfambra de Papelería, 2007. ISBN 9788461178179.
- Petts, G.E.; Amoros, C. Fluvial hydrosystems. London [etc.]: Chapman & Hall, 1996. ISBN 0412371006.

Complementary

- Toro, E.F. Shock-capturing methods for free-surface shallow flows. Chichester [etc.]: John Wiley & Sons, 2001. ISBN 0471987662.

- Gómez Valentín, M. Curso de depósitos de retención de aguas pluviales. Barcelona: Mcharly, 2009. ISBN 9788461371013.