



Course guide

250461 - MODAMB - Environmental Modelling

Last modified: 03/10/2023

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: MARC BERENGUER FERRER

Others: MARC BERENGUER FERRER

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

8231. The ability to plan, evaluate and regulate the use of surface water and groundwater resources.

8233. Knowledge of and the ability to understand dynamic phenomena of the coastal ocean and atmosphere and respond to problems encountered in port and coastal areas, including the environmental impact of coastal interventions. The ability to analyse and plan maritime works.

Transversal:

8559. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.

8560. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

8561. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

TEACHING METHODOLOGY

The subject is carried out in sessions of 3h, usually divided into 2 parts: One of theory and one of practice.

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.

LEARNING OBJECTIVES OF THE SUBJECT

Specialization subject in which knowledge on specific competences is intensified.

Knowledge and skills at specialization level that permit the development and application of techniques and methodologies at advanced level.

Contents of specialization at master level related to research or innovation in the field of engineering.

Specialization course in Environmental Engineering and Sustainability in which knowledge in specific competences of the Master in Road, Channel and Port Engineering is intensified. It has knowledge at the level of specialization in environmental modeling that should allow developing and applying advanced level techniques and methodologies. Knows contents of specialization at master level in the area of environmental modeling and relates them to innovation in the field of engineering. Acquires capabilities to integrate environmental requirements in the practice of engineering and in the process of technological and social innovation. It models complex environmental processes in which infrastructures or services intervene from the analysis of observed data of environmental variables.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	9,8	7.83
Hours large group	25,5	20.38
Hours small group	9,8	7.83
Self study	80,0	63.95

Total learning time: 125.1 h

CONTENTS

Introduction

Description:

Introduction. Approaches. Environmental modelling
Basics of probability and statistics

Full-or-part-time: 14h 23m

Theory classes: 3h

Practical classes: 3h

Self study : 8h 23m

Environmental models

Description:

Typologies, structure and formulations.
Phases of modeling and model development
Practical application
Modeling of environmental complexity.
Analysis of an environmental modelling example
Environmental models

Full-or-part-time: 28h 47m

Theory classes: 6h

Practical classes: 2h

Laboratory classes: 4h

Self study : 16h 47m



Data analysis and statistics

Description:

Descriptive statistics. Confidence interval. Hypothesis test. Transformations, Prediction intervals, Correlation.
Practical application

Full-or-part-time: 14h 23m

Practical classes: 4h

Laboratory classes: 2h

Self study : 8h 23m

Calibration and parameter estimation

Description:

Calibration of environmental models
Regression models. Analysis of variance. Practical application

Full-or-part-time: 12h

Theory classes: 3h

Practical classes: 2h

Self study : 7h

Model evaluation

Description:

Match and association analysis. Quality measures
Verification and validation.
Practical application
Simulation. Sensibility and uncertainty
Practical application

Full-or-part-time: 24h

Theory classes: 6h

Practical classes: 4h

Self study : 14h

Overview

Full-or-part-time: 14h 23m

Laboratory classes: 6h

Self study : 8h 23m

GRADING SYSTEM

The grade of the subject is divided into 60% of the activities carried out throughout the course, 40% of the final control.

EXAMINATION RULES.

If an activity is not carried out according to the guidelines, it will be marked as zero.



BIBLIOGRAPHY

Basic:

- Holzbecher, E. Environmental modeling: using MATLAB [on line]. 2nd ed. Berlin ; New York: Springer, 2012 [Consultation: 15/02/2021]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=885105>. ISBN 9783642220425.
- Wainwright, J.; Mulligan, M. Environmental modelling: finding simplicity in complexity [on line]. 2nd ed. Chichester, UK: Wiley, 2013 [Consultation: 16/02/2021]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=1116174>. ISBN 9781118366103.
- Smith, J.; Smith, P. Introduction to environmental modelling. Oxford: Oxford University Press, 2007. ISBN 9780199272068.

Complementary:

- Kottegod, N.T.; Rosso, R. Applied statistics for civil and environmental engineers [on line]. Second Edition. Oxford: Wiley?Blackwell, 2008 [Consultation: 28/10/2020]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=428240>. ISBN 978-1-4051-7917-1.
- Morgan, R.K. Environmental impact assessment: a methodological perspective. Dordrecht: Kluwer Academic, 1998. ISBN 0412730006.
- Ross, S.M. Introduction to probability and statistics for engineers and scientists. 5th ed. Oxford: Academic Press, 2014. ISBN 9780123948113.
- Berthouex, P.M.; Brown, L.C. Statistics for environmental engineers. 2nd ed. Boca Raton: Lewis, 2002. ISBN 1566705924.