

# Socio-Environmental Statistics and Decision-Making (250679)

## General Information

<b>School</b>	ETSECCPB
<b>Departments</b>	Departament d'Enginyeria Civil i Ambiental (DECA)
<b>Credits</b>	5.0 ECTS
<b>Programs</b>	MÀSTER UNIVERSITARI EN ENGINYERIA AMBIENTAL (pla 2014)
<b>Course</b>	2024/25

## Main teaching language at each group

- Group 10ES2 Spanish (Q2)

## Faculty

Responsible Faculty: Agustí Pérez Foguet  
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## Objectives of Education

CE01 - Apply scientific concepts to environmental problems and their correlation with technological concepts.

CE08-Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Explore scientific concepts and technical principles of quality management of the receiving means, atmosphere, water and soil, and applied to problem solving.

Explore scientific concepts and technical principles of management and treatment of gaseous emissions, water supply, sewage and waste and remediation techniques for groundwater and contaminated soils.

Sized systems for the treatment of major pollutants vectors in specific sectors of activity.

Interprets rules, identifies goals, assesses technical alternatives proposed unconventional solutions and priority actions.

Introduction to social and environmental statistics.

Multivariate statistics. Data about their composition.

Decision making. Utility theory. Risk and uncertainty.

Several criteria for decision making. Discrete methods.

Multiobjective optimization. Pareto efficiency.

Genetic and evolutionary algorithms.

Probabilistic graphical models.

Extreme Value Theory

## Competencies

### Especific

The ability to develop advanced approaches to analysing and assessing the sustainability of the built environment, including buildings, infrastructure and transport, which minimise their impact, and to choose the most appropriate options in agreement with one or more of the economic, social and environmental principles of sustainability.

Apply scientific concepts to environmental problems and their correlation with technological concepts.

## Transversal

**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.

**EFFECTIVE USE OF INFORMATION RESOURCES:** Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

**FOREIGN LANGUAGE:** Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

## 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

### Course contents

Introduction to social and environmental statistics. Introduction to statistical software.

Practical application

Multivariate statistics. FA, CA and EVT.

Probabilistic graphical models. Bayesian Networks.

A1

Multivariate statistics. GLM.

Practical application

Decision-making. Utility theory. Risk and uncertainty

Practical application

Multicriteria decision-making. Non compensatory methods.

Practical application

### Activities

#### Activity pursuit (individual)

Delivery of individual exercises proposed in the classroom

#### Dedication

4h

#### Synthesis Activity

Final control.

#### Dedication

2h

## Teaching Methodology

Theoretical classes are devoted to exposing the concepts and basic materials of the subject, presenting examples and carrying out exercises.

Guided activities are carried out to consolidate general and specific learning objectives.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

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 mark of the course is obtained from the ratings of continuous assessment. Continuous assessment consist in two activities, one to be done individually and another in group, and a written exam. The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises, including computing programming, results discussions, and oral and written presentation in predefined formats.

## Test Rules

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

The group activities can be qualified considering individual contributions.

## Office Hours

Thursday 14-16h.

## Bibliography

### Basic

- Hersh, M.A. [Mathematical modelling for sustainable development](#). Berlin: Springer-Verlag, 2006. ISBN 9783540242161.
- Kjærulff, U.B., Madsen, A.L. [Bayesian Networks and Influence Diagrams: A Guide to Construction and Analysis](#). Second edition. New Yor: Springer Science+Business Media, 2014. ISBN 9781461451037.
- Greco, S.; Ehrogott, M.; Figueira, J. [Multiple criteria decision analysis: state of the art surveys: volume 1 and 2](#). 2nd ed. New York: Springer, 2016. ISBN 9781493930944.
- Ugarte, M.D.; Militino, A.F.; Arnholt, A.T. [Probability and statistics with R](#). Second Edition. Boca Raton: Taylor and Francis Group, 2016. ISBN 978-1466504394.
- Ross, S.M. [Introduction to probability and statistics for engineers and scientists](#). 5th ed. Oxford: Elsevier Academic Press, 2014. ISBN 978012394811-3.