

Course guide

820019 - TMS - Environmental Technologies and Sustainability

Last modified: 22/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 717 - DEGD - Department of Engineering Graphics and Design.
748 - FIS - Department of Physics.
713 - EQ - Department of Chemical Engineering.

Degree: BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: OLGA ALCARAZ SENDRA - BARBARA SUREDA CARBONELL

Others: FRANCO HERNAN GOMEZ, IRENE LÓPEZ PEÑA, JAVIER SERRANO VÁZQUEZ, GEMMA TEJEDOR
PAPELL

PRIOR SKILLS

None

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

2. Understand the basic applications of environmental technologies and sustainability principles.

Transversal:

1. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world's situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.

TEACHING METHODOLOGY

Individual and / or group work, cooperative learning, viewing of documentaries, guided exercises, case studies (carried out in person and not in person).

Transparencies published weekly in ATENEA with locution of the part of theory. Students will have to listen and analyze them before going to class (1 hour of weekly non-contact theory work). In face-to-face theory class (1 hour of face-to-face work per week in the classroom), the content of the presentations will be worked on through specific exercises in small groups. The groups will be communicated to the students on the first day of theory class.

The practices are 2 hours, face-to-face and weekly.

Carrying out tests and examinations.

Submission of exercises or the dossier after the deadline or by any other means other than Athena will not be accepted.

LEARNING OBJECTIVES OF THE SUBJECT

- To give students an overview of the state of the world that focuses on limitations and imbalances.
- To analyse the concept of sustainable development and develop the ability to apply it in engineering.
- To make students aware of environmental and sustainable technologies and of their applications in the field of engineering: energy, transport, construction, etc.
- To analyse the role of technoscience and the social and environmental impact of technology.
- To apply the concepts and methods of the sustainability paradigm in the design, implementation, operational and decommissioning stages of any engineering project.
- To analyse existing systems and current and future problems in decision making on a global level.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	30,0	20.00
Hours small group	30,0	20.00

Total learning time: 150 h

CONTENTS

0. Course presentation

Description:

- 0.1 Introduction
- 0.2 Teachers
- 0.3 Course objectives
- 0.4 Syllabus
- 0.5 Agenda
- 0.6 Programming Jobs
- 0.7 Bibliography

Full-or-part-time: 10h

Theory classes: 2h
Practical classes: 2h
Self study : 6h

1. State of the world

Description:

- 1.1 Ecological phases of mankind
- 1.2 Carrying capacity
- 1.3 The great acceleration; growth and limits to growth
- 1.4 The anthropocene
- 1.5 The globalization

Specific objectives:

- Understand the problems of the world from a number of perspectives: economic, environmental, cultural, etc.
- Analyse globalisation as it now stands and its relationship with sustainability.

Full-or-part-time: 50h

Theory classes: 10h
Practical classes: 10h
Self study : 30h

2. Sustainable paradigm. Models of development. Sustainable Human Development

Description:

- 2.1 Sustainable Development concept
- 2.2 Mechanist paradigm vs. systemic paradigm. Complexity
- 2.3 Sustainability examples
- 2.4 Development models
- 2.5 Economics and environmental economy, and social economy

Specific objectives:

- Analyse the models of development
- Define the concept of sustainable development.
- Analyse the concept of sustainable development and its various interpretations.
- Analyse the application of the concept of sustainable development from industrial, political, social and economic perspectives.
- Understand the methodologies and instruments used to measure sustainable development.

Full-or-part-time: 40h

Theory classes: 8h

Practical classes: 8h

Self study : 24h

3. International organizations and multilateral agenda for 2030

Description:

- 3.1 Multilateral international policy
- 3.2 International reports, data and policies
- 3.3 International Agenda

Specific objectives:

- Understand the historical evolution of the political agenda and the international organizations.
- Analyze the role of the main international organizations.
- Analyze the multilateral agenda for 2030 and the main international treaties.
- Analyze the existing systems for decision-making at the international level

Full-or-part-time: 25h

Theory classes: 5h

Practical classes: 5h

Self study : 15h

4. Policies and technologies for sustainability

Description:

Methodologies and policies for sustainability. It is a cross-cutting topic that is worked on throughout the semester.

Specific objectives:

- Analyze individual and organizations responsibility to achieve sustainability
- Draw up sustainability paradigms in the design of products and the different methodologies that can be applied to them.
- Understand how sustainability paradigms are specified in production processes and apply the various existing methodologies to specific examples.

Full-or-part-time: 25h

Theory classes: 5h

Practical classes: 5h

Self study : 15h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the [Action Framework for Academic Integrity in Assessment at the UPC](#).

Assessment methods: assignments, oral presentations, two examinations (mid-semester and at the end of the year), practical problems and exercises.

Final mark: Mid-term exam= 33%; Final exam= 33%; Theory exercises developed in group in the classes= 17%; Practical dossier= 17%

The practical work assessment mark will be penalised by 0.5 points for each documentary test not completed and 0.3 points for each documentary test failed.

The language of the exams of the course (multiple choice questions) will be Spanish, except for the group in which the classes are in English, which will be in English.

There will be no re-evaluation exam.

BIBLIOGRAPHY

Basic:

- Xercavins, Josep [et al.]. Desarrollo sostenible [on line]. 2005. Barcelona: Edicions UPC, 2005 [Consultation: 17/06/2020]. Available on: <http://hdl.handle.net/2099.3/36752>. ISBN 8483018055.
- Mendoza Roca, José Antonio [et al.]. Ciencia y tecnología del medio ambiente. 1998. Valencia: Universidad Politécnica. Servicio de Publicaciones, DL 1998. ISBN 8477216894.
- Nebel, Bernard J. Ciencias ambientales : ecología y desarrollo sostenible. 6a ed. México [etc.]: Prentice Hall Hispanoamericana, cop. 1999. ISBN 9701702336.
- Sostenibilitat i enginyeria [on line]. Barcelona: Universitat Politècnica de Catalunya. Institut de Recerca en Ciència i Tecnologies de la Sostenibilitat, 2024 Available on: <https://is.upc.edu/ca/publicacions/llobres/sostenibilitat-i-enginyeria>. ISBN 9788410008823.
- Alarcón Jordán, M.; Àvila Castells, A.; Cunillera i Grañó, J. Canvi climàtic : evidències científiques [on line]. Barcelona: Iniciativa Digital Politècnica, 2011 [Consultation: 17/06/2020]. Available on: <http://hdl.handle.net/2099.3/36572>. ISBN 9788476536575.

Complementary:

- Worldwatch Institute. L'Estat del món ... : informe del Worldwatch Institute sobre el progrés cap a una societat sostenible. Barcelona: Centre Unesco de Catalunya, 199-?]-.
- Diamond, Jared M. Colapso : por qué unas sociedades perduran y otras desaparecen. Barcelona: Debate, 2005. ISBN 8483066483.
- Cabeza i Díaz, Rafael. L'Aigua, un recurs universal i escàs : iniciació al tractament i utilització racional de l'aigua. Barcelona: Beta, 1997. ISBN 8470913638.

RESOURCES

Other resources:

<https://www.un.org/sustainabledevelopment/es/objetivos-de-desarrollo-sostenible/> /> <http://hdr.undp.org/>