

Sustainability and Development Engineering (250463)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA) Institut Universitari de Recerca en Ciència i Tecnologies de la Sostenibilitat (IS. UPC)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) PARS: ENGINYER/A DE CAMINS, CANALS I PORTS (pla 2022)
Course	2024/25

Main teaching language at each group

- Group 10ES1 Spanish (Q1)

Faculty

Responsible Faculty: Agustí Pérez Foguet
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Objectives of Education

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 Civil Engineering is intensified. It has knowledge at the level of specialization in Environmental Engineering and Sustainability that must allow the development and application of advanced level techniques and methodologies. Knows master's degree content in the area of sustainable development and relates them to innovation in the field of engineering. Acquires capabilities to integrate requirements of sustainability in the practice of engineering and in the process of technological and social innovation. Know the roles that engineering, science and technology play in local, regional and international development processes, with special emphasis on approaches to sustainability and human development.

Competencies

Especific

The ability to analyse and interpret the regulation and impact of infrastructure and their repercussions for sustainable development, taking into account economic, environmental, social and cultural factors.

Transversal

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.

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.

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.

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

Introduction to development

Approach to the state of the world, governance and organizations.

Development, human rights, and international cooperation.

A1. Activity presentation

Engineering for development. Infrastructures, goods and services.

A1. Activity proposal

Sustainable human development

Concepts, principles and dimensions of Sustainability.

A2

Systems Ecological economy Global commons

Poverty and basic needs approach.

Capabilities approach. Other approaches. SDG 2030.

A1. Development.

Science, Technology and Engineering.

Appropriate technologies. Sustainability Science. Innovation.

A1. Presentation.

Information, Modelling, Decisions.

Systems engineering methodologies. Multi-criteria decision making.

A1. Technical development

Decision making. Uncertainty. Multicriteria decisions.

A1. Transfer.

Activities

Technological proposal for action with impact in the local development and linked to civil engineering.

Individual activity.

Dedication

2h

Conceptual map of sustainable human development in civil engineering

Dedication

1h

Learning control

Individual face-to-face control.

Dedication

3h

Teaching Methodology

The course consists of 3 hours per week of classroom activity.

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 60% from of continuous assessments and 40% from the final exam.

Test Rules

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

Office Hours

Thursday 14 to 16h. C2 310 or virtually.

Bibliography

Basic

- De Vries, B.J.M. [Sustainability science](#). Cambridge: Cambridge University Press, 2013. ISBN 9780521184700.
- Hersh, M.A. [Mathematical modelling for sustainable development](#). Berlin: Springer-Verlag, 2006. ISBN 9783540242161.
- Sachs, J.D. [The age of sustainable development](#). New York: Columbia University Press, 2015. ISBN 978-0231173155.
- Davis, M.L.; Cornwell, A.D. [Introduction to environmental engineering](#). 5th ed., int. ed. New York: McGraw-Hill, 2013. ISBN 9780071326247.
- Dresner, S. [The principles of sustainability](#). Second Edition. London: Routledge, 2008. ISBN 978-1844074969.
- Greed, C. [Introducing planning](#). London: Continuum, 2004. ISBN 9780826477521.

- Costanza, R.; Cumberland, J.H.; Daly, H.; Goodland, R.; Norgaard, R.B.; Kubiszewski, I.; Franco, C. [An introduction to ecological economics](#). Second edition. Raton, Fla: CRC Press LLC, 2015. ISBN 9781566706841.
- Jurin, R.R.; Roush, D.; Danter, J. [Environmental communication: skills and principles for natural resource managers, scientists and engineers](#). 2nd ed. Dordrecht ; London: Springer, 2010. ISBN 9789048139866.
- Manahan, S.E. [Environmental science and technology: a sustainable approach to green science and technology](#). Second Edition. Boca Raton: CRC Press, Taylor and Francis, 2007. ISBN 9780849395123.
- Mulder, K. [Sustainable development for engineers: a handbook and resource guide](#). Sheffield: Greanleaf Publishing Ltd, 2006. ISBN 9781874719199.
- Sen, A. [Development as freedom](#). Second edition. Oxford: Oxford University Press, 1999. ISBN 0198297580.
- Weiner, R.F.; Matthews, R.A. [Environmental engineering](#). Fourth Edition. Amsterdam: Butterworth Heinemann, Elsevier, 2003. ISBN 978-0750672948.

Complementary

- Mitsch, W.J.; Jørgensen, S.E. [Ecological engineering and ecosystem restoration](#). Hoboken: John Wiley & Sons, Inc., 2004. ISBN 978-0471332640.
- Anand, P.; Pattanaik, P.K.; Puppe, C. [The handbook of rational and social choice](#). Oxford: Oxford University Press, 2009. ISBN 9780199290420.
- Arrow, J.K.; Sen, A.K.; Suzumura, K. [Handbook of social choice and welfare](#). Amsterdam: Elsevier, 2002-2010. ISBN 0444829148.
- Shepherd, A.W. [Sustainable rural development](#). Basingstoke, Hampshire: Macmillan Publishers Ltd., 1998. ISBN 9780333664841.
- Riddell, R. [Sustainable urban planning : tipping the balance](#). Malden: Wiley Blackwell Publishing, 2004. ISBN 978-1405102902.
- Arrow, J.K., Sen, A., Suzumura, K. [Handbook of Social Choice and Welfare \(Volume 2\)](#),. Elsevier, 2011. ISBN 0444829148.