

Universitat Politècnica de Catalunya

SEBASTIA OLIVELLA & ANTONIO HUERTA

Outline of the presentation

Main figures

arcelona,

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- Structure of studies at Escola de Camins:
 - Degrees
 - Master Programmes
 - PhD Programmes
- Open Course Ware

Civil Engineering School: Main figures

Founded in 1973: the civil engineering school of Catalonia

- 3 degrees EU
- 13 Masters (8 + 5 Erasmus Mundus Masters), 8 PHD
- 85 international exchange agreements in 23 countries
 - 8 joint degrees (international)
- **19** laboratories, **5** research centres and **8** departments
- 2191 students (degree) : 8.4% of the UPC; but high research and TT presence (20% of UPC)
- 203 Teaching and research staff ; 40 admin staff
- 10th position in terms of scientific production among worldwide reference international institutions

Undergraduate Studies Implemented

Major	Length (old program)	Length (new program)
Civil Engineering	5	4
Construction Engineering Civil Construction, Hydrology, Transportation & Urban Planning	3	4
Geological Engineering	5	4

Titulació Titulación Major	1a Promoció 1ª Promoción 1ª Graduated	Titulats fins 2005-2006 Titulados hasta 2005-2006 Alumni until 2005-2006
Enginyeria de Camins, Canals i Ports Ingeniería de Caminos, Canales y Puertos 5 year Civil Engineering	1978	2,208
Enginyeria Tècnica d'Obres Públiques Ingeniería Técnica de Obras Públicas 3 year Civil Engineering	1990	1,750
Enginyeria Geològica. Ingeniería Geológica 5 year Geological Engineering	1995	196

EU, Bologna



Civil engineering (4 years)

Course structure	Description
First and second year	Basic subjects
Third and fourth year	Basic Civil Eng Technologies: structural engineering, water engineering, soil engineering and transport and territory engineering
Last year (4 th)	The student produces and presents a graduation final project
Internationalization	It is mandatory to do an international exchange in a foreign university (20 ECTS)

Construction engineering (4 years)

Course structure	Description
First and second year	Basic subjects
Third and fourth year	Structural subjects, water technology and transport and town planning engineering
Last year (4 th)	The student produces and presents a graduation final project
Company-sponsored educational agreements	An internship stage has to be done

Geological engineering (4 years)

Degree offered in collaboration with the **School of Geology** at the Universitat de Barcelona

Course structure	Description
First and second year	Basic scientific subjects
Third and fourth year	Basic technological subjects in geological and environmental engineering
Last year (4 th)	The student produces and presents a graduation final project
Internationalization	It is mandatory to do an international exchange in a foreign university (20 ECTS)

Degrees by subjects





Structural

(21)

Construction

Engineering (10.5)

Water

(21)

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Organization by semesters

Construction Engineering – Study Plan



Civil Engineering – Study Plan

Firs	st year		Second year	Third	i year	Fourth year		
Fundamentals of mathematics (6)	Algebra and geometry (6)	Strengt materials structu (9)	h of Mechanics of sand continua res (9)	Soil mechanics (9)	Hydraulics and hydrology (9)	Concrete structures (7,5)	Steel structures (6)	
Physics (6)	Geology (6)	Descript geome (6)	tive try			Hydraulic engineering (4,5)	Maritime and harbour engineering (6)	
Chemistry of construction materials (7,5)	Mechanics (7,5)	g t geometry	tial	Roadway and raihway engineering (7,5)	, Numerical modelling (9)	Surface and groundwater hydrology (4, 5)	Credittransfer (6)	
Calc (ulus 9)	ظ differen equatic (9)	differential equations Geomatics and (9) geographic information (6)	Urbanism (6)	Transportation (6)	Geotechnical engineering (4,5)		
		5 + &	Construction				G cological engineering (4,5)	Graduation project (12)
Economics and legislation (6)	Metric geometry and technical drawing (6)	metry Construction management inical materials electrica (6) engineeria (7,5)	tion management and electrical engineering (7,5)	Structural analysis (7,5) Environmental engineering (6)		Projects and business organisation (4, 5)		

Firs	st year	Second year		Third year		Fourth year		
Mathematic fundamentals (6)	Algebra (6)	Structural geology (6)	Stratigraphy (6)	Thermodynamics of natural processes (4,5)	Geological cartography (6)	Environmental impacts (4,5)	Geo- environmental engineering (6)	
Physics (6)	Geomatics, topography and graphic expression (6)	Differential	Geomorphology	Geographic information systems (4,5)	Geology for public constructions (4,5)	Mineral and energy resources (4,5)	Rock mechanics and underground excavations (6)	
	g	(7,5)	(1,1)	Probability and statistics (4,5)		Geotechnical engineering (4,5)	Credit	
(6)	Mechanics (7,5)	Numerical methods (6)		Geophysical prospection, geochemistry and seismology (9)		Hydrogeology (6)	recognition (6)	
ieneral geology (6)	Calculus	Petrology (7,5)	Materialsscience and technology (4,5)	Construction management and electrotechnics (4,5)	Numerical modelling (4,5)	Structural technology		
	(7,5)					project	project (12)	
Mine	ralogy 9)	Structures (9)	Continuum mechanics (6)	Hydraulics and hydrology (9)	Soil mechanics (9)	Projects and economy (4,5)	(11)	

Geological Engineering (Study plan)

- Size of courses
- Semesters with 4-6 courses
- 1 ECTS = 25 h = 11 h + 14 h
- FP + EC = 18 ECTS



Master	<i>"Ingeniero de Puerte</i>	Caminos, Car os"	nales y	Master in Geological Engineering
	Civil constructions	Hidrology	Transport ation	
Civil Eng	Const	truction E	ng	Geological Eng
			Civil Enginee	ring in Barcelona. 2011-1

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In preparation



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Master Programmes (Transient)

Civil Engineering

- Master in Civil Engineering (120 ECTS)
- Master in Geotechnical Engineering and Seismic Engineering (120 ECTS)
- Master in Structural Engineering & Construction (90 ECTS)
- Master in Numerical Methods in Engineering (90 ECTS)
- Master in Water Resources (120 ECTS)

Environmental, Sustainability and Natural Resources

- Master in Environmental Engineering (120 ECTS)
- Master in Sustainability (120 ECTS)

Transportation Engineering

Logistics, Transportation and Mobility (120 ECTS)

European Master Programmes: Erasmus Mundus

- Master in Computational Mechanics (120 ECTS) (Taught in English). Partner Universities: Swansea University, Universität Stuttgart, École Centrale Nantes
- CoMem: Master in Coastal and Marine Engineering and Management (120 ECTS) (Taught in English) Partner Universities: Delft University of Technology,Norwegian University of Science and Technology (Norway), University of Southampton, City University London
- Euroaquae: European master in Hydroinformatics and Water Management (120 ECTS) (Taught in English) Partner Universities: Université de Nice Sophie-Antipolis, University of Newcastle upon Tyne, Brandenburgische Technische Universität Cottbus, Budapest University of Technology and Economics
- Master in Structural Analysis of Monuments and Historical Constructions (SAMCH) (60 ECTS) (*Taught in English*) Partner Universities: Universidade do Minho, Università Degli Studi di Padova, Czech Technical University in Prague
 - Masters Course on Flood Risk Management (120 ECTS) (Taught in English). Starting September 2011
 Partner Universities: UNESCO-IHE Institute for Water Education, Delft, Technical University of Dresden, University of Ljubljana



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OPEN COURSE WARE

- According to the website of the OCW Consortium, an OCW project:
 - Is a free and open digital publication of high quality university-level educational materials, organized as courses, and often include course planning materials and evaluation tools as well as thematic content.
 - OpenCourseWare are free and openly licensed, accessible to anyone, anytime via the internet (such as Creative Commons)
- Inclusion of competences, capabilities and contents which come from "Officially approved" documents
- Inclusion of support material (in combination with Moodle)
- Transparency:

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- Openness
- Communication
- Accountability (LMS)

Camins OpenCourseWare

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Home Courses Portal Camins

Civil engineering Construction engineering Geological engineering



Civil engineering

The main objective of this degree is to train generalist engineers with a good formation in basic sciences and a broad vision of civil engineering. These studies provide the necessary knowledge for management, design and construction of roads, highways, canals, bridges, harbours, airports, dams, tunnels, sewage treatment plants, buildings, structures, water catchments and water supply infrastructures, railways infrastructure and urban planning, among others.

Language: English

Courses

Geotechnical engineering

egend:	Lecture	1	×	1	B	0
-	notes	Assignments	Labs	Exams	Videos	eBooks
Subject:						
Basic	sciences			Engin	eering app	blied sciences
Engineering tools			Basic technologies			
Proje infrastru	ct and construc ctures	tion of public works	s and	Struct	ural analys	sis and technology
Transport engineering and urbanism			Water	cycle engi	ineering	

First-grade subjects Algebra and geometry • 2 Calculus Economy and legislation Physics Mathematic fundamentals 12 Geology ~ Metric geometry and representation systems Rational mechanics Material chemistry Second-grade subjects Materia Geomatics and geographic information 80 Descriptive geometry Differential geometry and differential equation

	Construction materials
	Continuum mechanics
	Probability and statistics
	Construction management and electrotechnics
	Strength of materials and structures
Material	Third-grade subjects
	Structural analysis
	Roads and railways

	Environmental engineering
	Hydraulics and hydrology
	Soli mechanica
** 80	Numerical modelling
	Transportation
	Urbanism

Material	Fourth-grade subjects
	Geological engineering
	Geotechnical engineering
	Maritime and port engineering
	Steel structures
	Concrete structures
	Surface and groundwater hydrology
	Hydraulic constructions
	Projects and business organisation

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Home Courses Portal Camins

Home Syllabus Contents Calendar Activities Lecture notes Assignments Videos

Exams

Algebra and geometry

Syllabus

Course description

Students will acquire a general understanding of linear algebra, analytical geometry in two and three dimensions, and methods for solving linear problems encountered in engineering. They will also develop the skills to analyse and solve mathematical problems in engineering that involve these concepts.

Learning results

- On completion of the course, students will have acquired the ability to:
- 1. Interpret vector spaces;
- 2. Solve linear equation systems manually and using basic software;
- 3. Produce geometric interpretations of concepts in vector calculus;
- 4. Use algebraic methods applicable to vectors, matrices, operators and tensors, including basic operations, reduction to canonical form and change of base.

Course contents

Logic, set theory and algebraic structures; Vector spaces, including matrix algebra; Systems of linear equations, linear applications and bilinear forms and the basic algorithms used to solve them; Euclidean spaces; Determinants and their applications, in particular for calculating areas and volumes; Analytical geometry; Linear operators: Endomorphisms and spectral theorems, affine Euclidean spaces, eigenvalues and eigenvectors; Tensor algebra: Basic operations, change of base and tensor calculus

Generic objectives

Delve into the mechanisms of logical reasoning. Studying methods of solving linear problems that appear frequently in engineering. Submit items tensor algebra and analytic geometry.

Learning objectives

Ability to solve the types of mathematical problems that may arise in engineering. Ability to apply knowledge of: linear algebra; geometry; differential

Language: English

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Contents Calendar

Activities Lecture notes Assignments Videos Exams



Calendar

#Lecture	Торіс	Dedication	Study materials	
Unit 1: Linear maps				
1	Linear maps. Part 1	2.0 h	 Resum aplicacions lineals Apunts aplicacions lineals 	
2	Problems on linear maps. Part 1.	<mark>2.0 h</mark>	Problemes aplicacions lineals	
3	Linear maps. Part 2.	2.0 h	 <u>Resum aplicacions lineals</u> <u>Apunts aplicacions lineals</u> <u>Test aplicacions lineals</u> 	
4	Problems on linear maps. Part 2.	1.0 h	Problemes aplicacions lineals	
5	Linear mapsTest (P1)	2.0 h	Problemes aplicacions lineals	
Unit 2: Euclidean space				
6	Euclidean space. Part 1.	2.0 h		
7	Problems in Euclidean space. First part.	1.0 h		
8	Euclidean space. Part 2.	2.0 h		
9	Euclidean space. Part 3.	3.0 h		
10	Problems in Euclidean space. Second part.	1.0 h		



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Some Consequences of Bologna process

- Credit transfer system (ECTS): hours of study/work, a common system of qualification is desired, but "coins" and "notes" have not been unified
- Mobility: The target is that every student does mobility during the university studies. Compulsory mobility. Erasmus programs have been increased
- Cyclicity: The classical 5-6 year curricula permitted students to follow the studies at a slow velocity and with minimum marks. Even though they were good the system permitted some slow rate of passing the courses. Now, marks and efficiency affect admission to Master
- Controllability: The CaminsOCW described above is a new concept for contents, activities, bibliography, and other things publication in which much more transparency of what the students should learn is set up.
- Profession: Graduated in Engineering can access the professional marked. However, it is expected that a large number of them continue studies at the Master level.

Web Site

