

## Course file

<b>Study cycle</b>	BACHELOR IN CIVIL ENGINEERING		
<b>Course</b>	Construction and Rehabilitation Technologies	Mandatory	<input checked="" type="checkbox"/>
		Optional	<input type="checkbox"/>
<b>Course scientific area</b>	CIVIL ENGINEERING	Category	E

Course category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 3rd	Semester: 6th	ECTS: 5,5		Total: 149
Contact time	T: 22,5	TP: 45	PL:	S: OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Course Director	Title	Position
Manuel Brazão C. Farinha	Mestre	Professor Adjunto

### Learning objectives (knowledge, skills and competences to be developed by students)

(max. 1000 characters)

- O1. Identification of the most relevant project elements, framing and actors involved. Setting out of the project.
- O2. Basic notions of conservation and rehabilitation
- O3. Knowledge of available technologies for underground construction. Acquisition of skills to enable selection of the most appropriate solutions in each case, considering all constraints.
- O4. Knowledge of available technologies for aboveground structure construction. Acquisition of skills to enable selection of the most appropriate solutions in each case, considering all constraints.
- O5. Knowledge of available products and systems for the protection and repair of concrete structures
- O6. Knowledge of available technologies for masonry walls and roofing construction. Acquisition of skills to enable selection of the most appropriate solutions in each case, considering all constraints.

### Syllabus

(max. 1000 characters)

- CP1. Building projects: stages and design project actors; project documents. Notions of conservation and rehabilitation: Codes and technical specifications

CP2. Setting out techniques

CP3. Excavation, shoring and containment walls: shored and non-shored trench excavation; excavation containment with cast-in concrete piles and diaphragm walls; wall anchoring techniques

CP4. Drainage of underground water; lowering of ground water levels; waterproofing and drainage of buried construction elements.

CP5. Construction of foundations: concrete footings; driven pre-cast concrete piles and cast-in concrete piles

CP6. Building structures. Construction of RC structures: placing of reinforcement bars; formworks; production, transport, placing and protection of concrete.

CP7. Building pavements. Floor screeds

CP8. Repair and strengthening of concrete structures

CP9. Masonry wall construction. Renders and plasters.

CP10. Sloped and horizontal roofing; roof structures; waterproofing and drainage.

#### **Demonstration of the consistency between the syllabus and the course objectives**

(max. 1000 characters)

Syllabus items CP1 and CP2 are consistent with course objectives O1 and O2

Syllabus items CP3 to CP5 are consistent with course objective O3

Syllabus items CP6 and CP7 are consistent with course objective O4

Syllabus item CP8 is consistent with course objective O5

Syllabus items CP9 and CP10 are consistent with course objective O6

#### **Teaching methodology (evaluation included)**

(max. 1000 characters)

Lecturing of the course is divided in theoretical lessons and practical lessons.

Course booklets are provided and case studies are presented.

In the theoretical lessons building and construction elements are addressed as well as the construction technologies involved. Practical lessons comprise the presentation of case studies where the most

appropriated options are discussed and selected.

Assessment can be either continuous or summative. Continuous assessment involves two mid-term tests with a minimum grade in each midterm test of 8.0/20.0, and summative assessment an examination. In either case, a practical assignment must be submitted. Final grade is the weighted average of the mid-term tests/final examination (weighted 60%) and the practical assignment (weighted 40%).

**Demonstration of the consistency between teaching methodology and the course learning objectives**

(max. 3000 characters)

The objects of teaching methodology are realized through careful planning whereby knowledge transmitted in the theoretical classes is transposed to the practical lessons

In the practical lessons, and in relation to objectives O1 and O2, actual design projects are presented, easing learning on the part of the student.

In relation to objectives O3 to O6 several alternative construction methods are presented, for every situation, in relation to syllabus items CP1 to CP10.

The context of each particular situation is analyzed and the student acquires the necessary skills to choose the most adequate construction techniques in each case.

The practical assignment is very importante because it allows students to deepen a particular field of study, giving them both more technical competences and learning skills for other situations in the future.

**Main Bibliography**

(max. 1000 characters)

Course booklets.

"Tabelas Técnicas," J.S. Brazão Farinha, M. Brazão Farinha, J.P. Brazão Farinha, A. Correia dos Reis, ETL - 2003

"Escavações em terrenos com o nível freático instalado - Processos de bombagem de agua subterrânea, algumas recomendações práticas", J. C. Silva Pereira, 1º Simpósio Nacional - Materiais e Tecnologias na Construção de Edifícios, 1985

"Tecnologia de Fundações", Silvério Coelho, EPGE, 1996

"Il Consolidamento dei Terreno e dei Fabbricati", Fernando Lizzi, Dario Flaccovio Editore - 1989

"Curso de Ancoragens", LNEC, 1979



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"Construção Anti-Sísmica", E. Cansado Carvalho, C. Sousa Oliveira, LNEC, 1999

"Classificação e descrição geral de revestimentos para paredes de alvenaria e betão", José A. Carvalho Lucas, LNEC, 1990

"Curso de Coberturas de Edifícios", LNEC, 1976

"Sistemas de Construção" (5 volumes) - Jorge Mascarenhas, Livros Horizonte, 2004

NP EN 1504 - Products and systems for the protection and repair of concrete structures, 2005