Course Unit	Special Structures Design			Field of study	Solid Mechanics and Structures		
Master in	Construction Engineering			School	School of Technology and Management		
Academic Year	2020/2021	Year of study	2	Level	2-2	ECTS credits	6.0
Type	Semestral	Semester	1	Code	5024-419-2103-00-20		

Workload (hours)	162	Contact hours	T -	TP 60	PL -	TC -	S -	E -	OT -	O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tuturial; O - Other

Name(s) of lecturer(s): Carlos Liberal Moreno Afonso, Debora Rodrigues de Sousa Macanjo Ferreira

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Identify different techniques of prestressing in concrete structures and their methods of analysis and design.
2. Understand the techniques of rehabilitation and strengthening of structures.

Prerequisites

Before the course unit the learner is expected to be able to:
1. Apply knowledge and principles of strength of materials
2. Structural element analysis

Course contents

Prestressed structures. Prestressing technology and methods. Tendon profiles and equivalent loads. Cross-sections design. Design of isostatic beams. Calculation of prestressing losses. Indeterminate prestressed structures. Behaviour of materials and application techniques of strengthening of structures. Assessment of the reinforced structures.

Course contents (extended version)

1. Chapter 1 - Prestressed structures
   - Prestressing technology and methods
   - Equivalent loads
   - Cross-sectional design
   - Design of isostatic beams
   - Calculation of prestressing losses
   - Statically indeterminate structures
   - Phased construction
2. Chapter 2 -Techniques of repair and structural reinforcement
   - Introduction to the strengthening of structures
   - Safety assessment of existing structures and design for structural reinforcement
   - Reinforcement design
   - Reinforcement design with FRP composites systems
   - Techniques for the application of FRP reinforcement

Recommended reading

1. Comité Euro-International du Béton; CEB-FIP model code 1990. ISBN: 0-7277-1696-4
2. Féderation Internationale du Béton; Structural concrete. ISBN: 2-88392-041-X (vol. 1)
3. Costa, A. , Reforço e reabilitação de estruturas, Mestrado em Engenharia Civil, 2002
4. ULL; Planning and design handbook on precast building structures. ISBN: 174266115
5. Chilton, John (2000). Space Grid Structures, Architectural Press, Oxford

Teaching and learning methods

Theoretical-practical classes: Presentation and discussion of all contents with simple ilustration problems.

Assessment methods

- General - (Regular, Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 50% (10 points with a minimum grade of 35% in the written test)
  - Intermediate Written Test - 50%

Language of instruction

1. English
2. Portuguese

Electronic validation

Carlos Liberal Moreno Afonso, Debora Rodrigues de Sousa Macanjo Ferreira	Luís Manuel Ribeiro Mesquita	Manuel Teixeira Brás César	Paulo Alexandre Vara Alves
27-10-2020	27-10-2020	27-10-2020	06-11-2020