

Course Unit	Structural Analysis II		Field of study	Mechanics of Materials and Structural Concrete	
Bachelor in	Civil Engineering		School	School of Technology and Management	
Academic Year	2023/2024	Year of study	3	Level	1-3
Type	Semestral	Semester	1	ECTS credits	6.0
Code	9089-322-3102-00-23				
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 - Tutorial; O - Other

Name(s) of lecturer(s) 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. Study of the principles of behavior of reticulate structures and development of the displacement method to calculate it
2. Cross method

#### Prerequisites

Before the course unit the learner is expected to be able to:

1. Analysed the internal forces in isostatics structures
2. Determinate the internal forces diagrams

#### Course contents

Displacement method applied to: Hyperstatic truss structures and Hyperstatic continuous structures. Determinated mixed structures. Hardy Cross Method.

#### Course contents (extended version)

1. Chapter 1 - Analysis of structural hiperstaticity degree
  - Trusses structures
  - Continuous structures
2. Chapter 2 - Displacement Method
  - The displacement method as strength method's dual method
  - Direct formulation of the displacement method in the structures analysis.
  - Obtaining of an equation system
  - Determination of the final efforts.
  - Notion of stiffness matrix of a beam
  - Application of the displacement method in structures with beams with despicable axial deformability.
  - Use of the principle of virtual work to determine the fixation forces
  - Determination of the mobility degree of structures with beams despicable axial deformation
3. Chapter 3 - Hardy Cross Method
  - Introduction to the method
  - Notion of distribution and transmission coefficient
  - Particular case of Hardy Cross method
  - Application of Hardy Cross method to structures with freedom of displacement of nodes
  - Indirect Hardy Cross method

#### Recommended reading

1. Sebenta "Método dos deslocamentos", Prof. Joaquim António Oliveira de Barros - Universidade do Minho
2. Sebenta "Teoria das estruturas" - FEUP
3. Sebenta de Estruturas II "Método dos Deslocamentos" - IPB
4. Sebenta de Estruturas II "Método de Cross" - IPB

#### Teaching and learning methods

Theoretical-practical classes: Presentation and discussion of all contents in theoretical classes along with simple illustration problems. In theoretical-practical classes is proposed and discussed a set of application associated to theoretical issues. Four complementary individual exercises will be proposed and evaluated

#### Assessment methods

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
- Final Written Exam - 100%

#### Language of instruction

Portuguese, with additional English support for foreign students.

#### Electronic validation

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29-09-2023	03-10-2023	07-10-2023