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	2022/2023	Year of study	3
Level	1-3	ECTS credits	6.0
Type	Semestral	Semester	1
Code	9089-322-3102-00-22		

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 od 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 distribuition 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 ilustration 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

Debora Rodrigues de Sousa Macanjo Ferreira	Luís Manuel Ribeiro Mesquita	António Miguel Verdelho Paula	Paulo Alexandre Vara Alves
28-09-2022	06-10-2022	11-10-2022	07-11-2022