INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Roads			Field of study	Roads		
Bachelor in	Civil Engineering			School	School of Technology and Management		
Academic Year	2021/2022	Year of study	3	Level	1-3	ECTS credits	6.0
Type	Semestral	Semester	2	Code	9089-322-3205-00-21		

Workload (hours)	162	Contact hours	T	TP	PL	TC	S	E	OT	O
			30	30	-	-	-	-	-	-

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): Manuel Joaquim da Costa Minhoto

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Know the elements of a road, particularly the geometric definition
2. Design the best solution of the corridors of communication, considering the regulations and technical aspects, using survey studies, geotechnical studies, environmental impact studies and others
3. Design and analysing the cross elements of a road - profiles, cross-platform and other types of cross elements, involved in construction
4. Evaluate of earthworks by using current methods of earthworks processes and equipments
5. Study the soils distribution associated to the road´s earthworks. Knowing main equipments and processes, involved in road earthworks
6. Introduction to the main elements about drainage and current road pavements

Prerequisites

Before the course unit the learner is expected to be able to:
1. Know the ground representation methods
2. Know general design concepts - descriptive geometry - as well as the use of CAD software

Course contents

General aspects about transport infrastructures. Geometrical design of roads: Straight line, profiles and cross section of a road. Hyhway design standarts. Earthworks. Basic aspects about drainage and about road pavements.

Course contents (extended version)

1. Basics about transport infrastructures
   - Main road elements
   - Features types, design controls and criteria, considered in road design
   - Steps in road design
   - Highway design standards
   - General geometrical definition of a road
2. Geometric definition of a road in plan
3. Straight lines
4. Circular curves
   - Elements of a circular curve
   - Movement in circular curve
   - Minimum radius
   - Superelevation
   - Transverse friction
   - Over-width
5. Transition curves: clothoids
   - Definitions, studied in road design point view
   - Design of clothoids
   - Deployment of clothoids
6. Special curves
7. Homogeneity in plan of alignments
8. Definition of the longitudinal profile
   - Vertical alignments
   - Curves of agreement of alignments
   - Minimum of vertical radius
9. Vertical and horizontal coordination
10. Cross-section of a road
    - Main elements of a cross-section
    - Cross-sectional design on a road
    - Typical configurations of the cross-sections
11. Earthworks
    - Evaluation of areas of the cross-sections
    - Evaluation methods of volumes of earths
    - Application of the studied methods
12. Study of earths distribution on a road (Bruckner graph)
13. Basic aspects about drainage end road pavements

Recommended reading

1. Picado-Santos, Luís, Branco, Fernando. “Vias de Comunicação – volume I”. Universidade de Coimbra;
2. Normas de Projecto da JAE;
3. Branco, Fernando; Santos, Luís Picado; Capitão, Silvino. Coordenação de Luís Picado Santos. 1999. Sebenta de Vias de Comunicação II — Universidade de Coimbra. Coimbra
4. Pavimentos Rodoviários – Paulo Pereira e Luís Picado dos Santos, 2002
5. Brockenbrough, Roger L.. HIGHWAY ENGINEERING HANDBOOK. Building and Rehabilitating the Infrastructure. 2009

Teaching and learning methods

The unit will be taught using a combination of lectures, self guided learning oriented by teacher, with the development of a practical project, and practice classes with resolution of exercises. The practical work is aimed at implementing the application of the contents of the theoretical and practical classes. Real cases of road design must be analysed.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 80% (Comprising of a practical part (50%) and a theoretical part (30%))
   - Practical Work - 20% (Practical work contemplating the geometric design of a road.)
2. Alternative 2 - (Regular, Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 80% (Comprising of a practical part (50%) and a theoretical part (30%))
   - Case Studies - 20% (Written test, aimed a road case problem. Replaces the practical work evaluation.)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

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21-02-2022	21-02-2022	04-03-2022	25-03-2022