

Course Unit	Electrical Networks and Installations		Field of study	Energy	
Bachelor in	Renewable Energy Engineering		School	School of Technology and Management	
Academic Year	2023/2024	Year of study	2	Level	1-2
Type	Semestral	Semester	1	ECTS credits	6.0
			Code	9910-743-2105-00-23	
Workload (hours)	162	Contact hours	T -	TP 30	PL 24
			TC 4	S 2	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) Luís Manuel Montenegro de Araújo Pizarro, Orlando Manuel de Castro Ferreira Soares

### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Know materials for electrical wiring and apparatus, have deep understanding about rules of Low Voltage electrical installations conception and electrical wiring protection and sizing;
2. Know about the constitution of primary and distribution substations and to have skills about MV/LV underground networks, envisaging the investigation, project, execution and inspection;
3. Know communications networks materials in urbanisations and sizing telecommunications infrastructure, envisaging the investigation, project, execution and inspection;
4. Know about the electrical energy tariff systems and to apply knowledge about techniques of rational usage of electrical energy.

### Prerequisites

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

1. Analyse electrical energy systems in "per unit".
2. Solve power flow and short-circuit problems.
3. Utilise CAD tools and spreadsheets.

### Course contents

Electrical infrastructures of public service and/or private lots or urbanizations. Feeding systems. MV/LV underground networks. The electrical and telecommunication project – rules for the conception, approval and network connection. Elaboration of electrical and telecommunication infrastructures projects of lots or urbanisations. Energy management in buildings.

### Course contents (extended version)

1. Electrical infrastructures of lots or urbanisations of public service and/or private initiative.
  - Materials for electrical wiring and apparatus.
  - Calculation techniques for electrical installations.
  - Sizing and protection of electrical wiring.
2. Feeding systems
  - Power substations and switching substations
  - Distribution substations
3. Underground MV/LV networks
  - Electrical energy distribution networks and public lightning.
  - Several categories of electrical installations.
4. Electrical project – conception rules, approval and connection to the grid.
5. Development of electrical infrastructures of public service or private lots or urbanisations
  - Constituent parts of an infrastructures electrical project.
  - Proceedings
  - Written parts and drawn parts.
6. Telecommunications infrastructures in urbanisations.
  - Communication networks in urbanisations – The ITUR project.
  - Installation – Technical conditions of the work execution.
7. Development of exterior communication infrastructures project of an urbanisation.
8. Tariff systems and electricity cost build up.
  - Actions and techniques for rational usage of electrical energy.
  - Control and improvement of power factor.

### Recommended reading

1. Regulamentos de segurança e disposições regulamentares aplicáveis.
2. Guias e cadernos técnicos, catálogos e outros documentos normativos.
3. Projecto tipo dos Postos de Transformação, DGEG; Legislação e Normas.
4. Regras Técnicas das Instalações Eléctricas de Baixa Tensão, Portaria nº 949-A/2006 de 11 de Setembro/ 1ª edição anotada: Vol. I, II e III, DGGE/CERTIEL, 2006
5. Textos de apoio, cópias de lições, de acetatos e de elementos de estudo.

### Teaching and learning methods

Lectures and problem-solving classes: Presentation of concepts connected to different contents. Application of expositive and interrogative method. Problem-solving, project or laboratory classes: solving application exercises and working problems. Application of active and interrogative method. Frequent use of catalogues and manufacturers tables.

### Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final, Supplementary)
  - Practical Work - 60%
  - Final Written Exam - 40% (Minimum score of 7 in the exam (on a scale of 20) to obtain approval for the course.)
2. Alternative 2 - (Regular, Student Worker) (Special)
  - Final Written Exam - 100%

Language of instruction

Portuguese

Electronic validation			
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