School of Agriculture
Course Unit Syllabus

Level of qualification:
Short cycle (TESP)
Study cycle:
Environmental Protection Systems

Course Unit: **223521** – **Equipments and Automation**

Year 2 **Semester 3** **ISCED Code: 715** **ECTS: 4.0**

Tipe of Course Unit: Compulsory **Delivery Mode:** Face-to-face **Language of Instruction:** Portuguese

COURSE COORDINATOR: João Jorge Mestre Dias

HOURS OF WORK

TOTAL HOURS	Contact Hours								Hours in autonomous work
	Theory	Theory and practice	Practical and laboratory work	Field work	Seminar	Internship	Tutorial guidance	Other	
100		**10**	**35**						**55**

Prerequisites (if applicable): Not applicable

LEARNING OUTCOMES (knowledge, skills and competence)

With this discipline the student must be able to identify the main equipment present in processes related to environmental protection, identify the main quality parameters of a water for industrial use, types of air compressors, elements in automatic control, so identify emerging needs and communicate professionally with production engineers and maintainers. It is also intended that the student acquire sensitivity to the importance of the rationalization of energy consumption and the importance of the treatment of exhaust gases.

CONTENTS

1. Solid, liquid and gaseous reagent dispensers
2. Water quality for industrial use
3. Treatment of industrial effluents
4. Theoretical fundamentals in the production of compressed air
5. Types of compressors: compressors with oil and without oil
6. Elements of a compressed air network.
7. Introduction to automatic process control and instrumentation.
8. Dynamic variables: temperature, level, mass, pressure and flow
9. Measuring equipment: mass, level, pressure, flow and temperature sensors.
10. Controller types: on / off, proportional, proportional-integral, proportional-derivative, and PID
11. Types of valves
12. Combustion and treatment of gases

DEMONSTRATION OF THE CONTENTS COHERENCE WITH THE COURSE UNIT'S LEARNING OUTCOMES

The program contents are in line with the objective of the curricular unit as the program is designed to address in an integrated way the identification of the main equipment related to effluent treatment (# 1 to 3), the principles of automation in industrial control (#7 to 10), starting with the analysis of theoretical concepts of equipment and sensors (#7 to 9), including elementary principles of electricity (# 9), and practical applications. The discipline also includes a component of different energy sources in the industry such as compressed air (# 4 to 6) and combustion (# 12), also addressing different sources of renewable energy

TEACHING METHODOLOGIES

1. Learning and research practice in appropriate bibliography (Internet, technical catalogs, books and magazines). 2. Analysis of technical information regarding instrumentation and automatic process control. 3. Realization of practical work in the technology plant. 4. Conducting practical research work, with presentation in the classroom.

DEMONSTRATION OF THE COHERENCE BETWEEN THE TEACHING METHODOLOGIES AND THE LEARNING OUTCOMES

The development of the classes will be carried out harmonizing the teaching methodologies with the fundamental objectives of the course unit (CU). This will be a CU with practical approach, where students will learn the theoretical knowledge (# 1 and 2) but especially the practical application (# 3 and 4). Given the eminently practical nature of the issues to be dealt with, several practical cases will be presented in some industries in the region (# 4). The practical work required to the students will have an important contribution to the achievement of the objectives defined for the CU, providing the understanding and the application of the topics under study, as well as allowing contact with companies in the region in order to obtain technical and specific information, many times available in the literature (# 4). The practical work will also have the advantages of deepening knowledge obtained in the context of the classroom, searching for external information and, therefore, contact with reality. Their subsequent presentation in a room context will allow the disclosure of the information by the rest of the class

EVALUATION METHODS

Demonstration of knowledge in theoretical examination and evaluation of practical work. The final grade is calculated based on the average of the theoretical exam and practical work. None of the partial scores (exam or work) may be less than 8 values (in a scale from 0 to 20).

MAIN BIBLIOGRAPHY

NOVAIS, J. (1995). Ar comprimido Industrial – produção, tratamento e distribuição. Ed. Fundação Calouste Gulbenkian

SPIRAX-SARCO (2007). The steam and condensate loop. 1st Ed. Spirax-Sarco, Gloucestershire

ATLAS COPCO (2010). Compressed air manual. 7th edition. Ed. Atlas Copco Airpower NV, Wilrijk

WEBSTER, J. (1999). The measurement, instrumentation and sensors handbook. Ed. CRC Press

SMITH, C. (2002). Automated continuous process control. Ed. John Wiley & Sons, New York

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