School of Agriculture
Course Unit Syllabus

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

Course Unit: **223513** – **Wastewater Treatment Sistems**

Year 1 **Semester 2** **ISCED Code: 712** **ECTS: 5.0**

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

COURSE COORDINATOR: Anabela Cândida Ramalho Durão

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	
125		**10**	**45**						**70**

Prerequisites (if applicable): Not applicable

LEARNING OUTCOMES (knowledge, skills and competence)

To apply knowledge regarding processes and technologies used in the treatment and control of wastewater. To distinguish operations and treatment processes applicable to the wastewater quality required for discharge into the receiving environment. To acquire knowledge that allows him to identify and characterize the main wastewater treatment plants and systems. To have capacity to act in the management and control of a Wastewater Treatment Plant (WWTP) according to the safety, hygiene and environmental protection standards.

CONTENTS

Operations and unit processes involved in wastewater treatment: Physical operations: Flow measurement. Disappearance. Graduation. Tamping. Equalization. Flotation. Sedimentation. Gas transfer. Chemical processes: Chemical precipitation.

Adsorption. Disinfection. Biological processes: Fundamental concepts of biological treatment. Activated sludge systems: conventional process, high load process, prolonged aeration process, contact / stabilization process; oxidation ditch. Percolating beds: principles and functioning. Low and high load beds. Systems of biological disks. Imhoff tank. Stabilization ponds.

Anaerobic wastewater digestion. Sludge treatment systems: anaerobic digestion, aerobic digestion, chemical conditioning, thermal conditioning, dehydration. Anaerobic and aerobic biological treatments. Treatment of sludge and its final disposal. Characteristics of sludge. Thickening. Digestion. Aerobic digestion.

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

This course unit is intended to provide students with information about the processes and technologies used in the treatment and control of wastewater, so the program contents were selected in order to address the theoretical and practical issues of unitary operations and processes , their characteristics and principles and functioning, thus contributing to identify and characterize the main wastewater treatment plants and treatment systems to act in the management and control of a WWTP in accordance with safety, hygiene and environmental protection standards.

TEACHING METHODOLOGIES

Expositive, demonstrative methods (with the visualization of videos, field trips), participatory methods and group work with case study.

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

The teaching methodologies adopted: the expository methodology for the fundamental concepts, principles, operations of the processes that occur in a WWTP; participatory methodology that requires interactive exposure with students; the demonstration methodology with learning through videos, study visits and exploration and evaluation procedures of the WWTP thus contributed to the identification and characterization of the different unit processes in the WWTP.

EVALUATION METHODS

1- Continuous evaluation: two frequencies and practical works (PW) (in group or / and individual) 2- Evaluation by Examination and practical works

The final grade will be calculated based on the following equation for continuous assessment:

G = 0.4 * Mean of PW + 0.6 (F1 + F2) / 2

Or for examination evaluation: G = 0.4 * Mean of TP + 0.6 E

At where:

PW- Practical Work F - Frequency

E - Exam

MAIN BIBLIOGRAPHY

Some elements of study will be available on the course e-learning page (Moodle)

Metcalf & Eddy; AECOM (2013) Wastewater Engineering Tratment and Resource Recovery (5th edition) Grady Jr; CPL; Daigger, GT; Love, GN & Filipe, CDM. (2011). Biological Wastewater Treatment. (3 ed.)

Metcalf & Eddy (2003) Wastewater Engineering Treatment, Disposal and Reuse (4th ed/revised) International Edition

Peavy, H; Rowe, D & Tchobanoglous, G (1985) Environmental Engineering. Mc Graw-Hill Series in Water Resources and Environmental Engineering

Arar, A & Pescod, MB (1988) Treatment and Use of Sewage effluent for Irrigation. (1st Published) Food and Agriculture Organization of the United Nations, Butterworths, Italy

Arcevaila, SJ. (1981) Wastewater Treatment and Disposal Engineering and Ecology in Pollution Control (1st ed.). Marcel Dekker, Inc

Sperling, MV (2011) Princípios básicos do tratamento de esgotos. Volume 2. Departamento deEngenharia Sanitária e Ambiental, Universidade Federal de Minas Gerais

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