

Course Unit	Solid Waste and Waste Water Management		Field of study	Environment Protection	
Bachelor in	Environmental Engineering		School	School of Agriculture	
Academic Year	2022/2023	Year of study	3	Level	1-3
Type	Semestral	Semester	2	Code	9099-309-3205-00-22
ECTS credits	6.0				
Workload (hours)	162	Contact hours	T 30	TP -	PL 30
			TC -	S -	E -
			OT 20	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) Amílcar António Teiga Teixeira, Maria Sameiro Ferreira Patrício

Learning outcomes and competences

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

1. Manage solid waste treatment plants.
2. Understand and perform the basic conception of collection and treatment systems of solid wastes;
3. Identify the principal contamination problems of wastewater;
4. Assess the treatment performance of wastewater treatment plants;
5. Understand and perform the basic conception of wastewater treatment plants.

Prerequisites

Before the course unit the learner is expected to be able to:
Basic knowledge on physics, chemistry, biology and mathematics.

Course contents

(Part I. Solid Waste) 1. Introduction 2. Production 3. Management hierarchy 4. Transport and collection systems 5. Separation and processing 6. Treatment and valorization 7. Disposal 8. Systems' planning and management (Part II. Wastewater) 1. Wastewater characteristics and treatment models 2. Collection systems 3. Preliminary and primary treatment 4. Secondary treatment 5. Advanced techniques 6. Sludge treatment 7. Operational control of wastewater treatment plants

Course contents (extended version)

1. Part I - Waste
 - Introduction: Basic concepts and historical review;
 - Waste characterisation: Quantitative and qualitative methods;
 - Prevention: waste minimization, reuse and recycling;
 - Waste collection systems; Household Waste - Refuse Collection; Transport and Transfer.
 - Sorting/Processing of waste; Waste processing plants.
 - Waste treatment and valorization; Recycling; Composting; Biomethanization and Energy Production.
 - Landfill and waste deposits; Planing; Implementation; Operation; Monitoring and Control.
 - Integrated waste management; Management tools.
2. Part II - Wastewater
 - Wastewater: origins, characterization, legal framework and global treatment model.
 - Wastewater interception systems: function, typologies, constitution and pump stations.
 - Preliminary treatment: screening, solids reduction, grit removal, flotation, flowrate measurement
 - Primary treatment: flow equalization, primary sedimentation, coagulation/floculation
 - Secondary treat. : activated sludge systems, trickling filt. , rotating biol. contactors, lagoons.
 - Advanced wastewater treatment: biological nitrogen and phosphorus removal and disinfection processes.
 - Sludge treatment: thickning, alkaline stabilization, dewatering and digestion.
 - Operational control: sampling and control tests; analysis of problems and malfunctions, reporting.

Recommended reading

1. Martinho M. G. e Gonçalves M. G. (2000). A Gestão de Resíduos. Universidade Aberta.
2. Tchobanoglous, G. ; Theisen, H. ; Vigil, S. A. (1993). Integrated Solid Waste Management: Engineering Principles and Management Issues. McGraw-Hill International Editions, United States of America.
3. Cheremisinoff, N. P. (1999). Biotechnology for waste and wastewater treatment. Noyes Publications. USA.
4. Spellman F. R. (2004). Mathematics Manual water and wastewater treatment plant operators. CRC Press. USA
5. Tchobanoglous G. , F. L. Burton, H. D. Stensel, (2003). Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy Inc. , 4th ed. , McGraw-Hill

Teaching and learning methods

Classes are divided in theoretical (T), practical (P) and Tutorial (OT). In theoretical classes subjects are presented. In Practical classes, students are assisted in developing on-class works and research activities. In tutorial classes, students receive further assistance in ongoing research activities.

Assessment methods

1. Alternative 1 - (Regular) (Final, Supplementary, Special)
 - Practical Work - 30% (Two group work assignments: one about solid waste and other about wastewater treatment)
 - Final Written Exam - 70%
2. Alternative 2 - (Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 70%
 - Practical Work - 30% (Two individual work assignments or a practical exam.)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Amilcar António Teiga Teixeira, Maria Sameiro Ferreira Patrício	Manuel Joaquim Sabença Feliciano	Artur Jorge de Jesus Gonçalves	Maria Sameiro Ferreira Patrício
05-12-2022	08-12-2022	08-12-2022	19-12-2022