

Course Unit	Water and Wastewater Treatment Methods		Field of study	Environmental Protection Technology	
Master in	Environmental Technology		School	School of Agriculture	
Academic Year	2020/2021	Year of study	1	Level	2-1
Type	Semestral	Semester	2	ECTS credits	6.0
Code	1076-409-1203-00-20				
Workload (hours)	162	Contact hours	T 30	TP -	PL 40
			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) Manuel Joaquim Sabença Feliciano

Learning outcomes and competences

- At the end of the course unit the learner is expected to be able to:
1. Identify the major unit operations and processes of water and wastewater treatment plants
 2. Evaluate the performance of water and wastewater treatment plants
 3. Cooperate in the planning and design of water and wastewater treatment systems
 4. Develop applied research in the field of water and wastewater treatment

Prerequisites

- Before the course unit the learner is expected to be able to:
1. have a good knowledge of fundamental concepts of engineering sciences
 2. have a good knowledge on the basic operation principles of chemical and biological reactors

Course contents

1. General characterization of water and wastewater; 2. Water and wastewater treatment systems; 3. Physicochemical processes of water and wastewater treatment.
4. Biological processes of wastewater treatment; 5. Sludge treatment processes;

Course contents (extended version)

1. Water and wastewater characteristics
 - Physical characteristics
 - Chemical characteristics
 - Biological characteristics
 - Sampling and analytical methods
2. Water and wastewater treatment systems
 - Constitution and treatment goals of WTP
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 - Current status and future trends
3. Physicochemical processes of water and wastewater treatment
 - Preliminary operations: screening, tamisation and coarse solids reduction systems
 - Flow Equalization and homogeneization
 - Coagulation and flocculation
 - Sedimentation and Flotation
 - water softening and water stabilisation
 - Ion exchange and carbon adsorption
 - Filtration and membrane separation technologies
 - Disinfection
4. Biological systems of wastewater treatment
 - Activated sludge treatment systems
 - trickling filters systems
 - Rotating Biological Contactor
 - Lagoon systems
 - Moving Bed Reactors
 - Membrane reactors
 - Constructed wetland systems
5. Sludge treatment processes
 - Major characteristics and sludge disposal
 - Sludge thickening
 - Aerobic and anaerobic sludge stabilization
 - Sludge dewatering

Recommended reading

1. Glueckstein, L. et al. (1992) "Design of Municipal Wastewater Treatment Plants", Volume I & Volume II, WEF & ASCE, Book Press, Inc. , Brattleboro, Vermont, 1592 p.
2. Cheremisinoff, N. P. 2002. Handbook of water and wastewater treatment technologies. Butterworth-Heinemann, USA.
3. Kiely G. (1999) "Ingeniería Ambiental. Fundamentos, entornos, tecnología y sistemas de gestión" McGraw-Hill/Interamericana de España, Madrid, 1331 p.
4. Metcalf & Eddy, (2003) "Wastewater engineering. Treatment and reuse", 4ª edition, McGraw-Hill, New York, 1819 p.
5. Seviour, R. J. ; Blackall, L. L. (1999) "The microbiology of Activated Sludge" Kluwer Academic Publishers, Dordrecht, 422p.

Teaching and learning methods

Conventional lectures with oral presentation of subjects. Labs based upon development of practical exercises. Field trips to water and wastewater treatment plants are also included, in order to help in the assimilation of the theoretical concepts. In tutorial classes, students receive further assistance in ongoing research activities.

Assessment methods

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 70% (Every student shall have to attend at least 75% of the classes)
 - Practical Work - 30%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

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08-11-2020	08-11-2020	09-11-2020	09-11-2020