

Course Unit	Water and Wastewater Treatment Methods		Field of study	Environmental Protection Technology	
Master in	Environmental Technology		School	School of Agriculture	
Academic Year	2022/2023	Year of study	1	Level	2-1
Type	Semestral	Semester	1	ECTS credits	6.0
Workload (hours)		162	Contact hours	T 30   TP -   PL 40   TC -   S -   E -   OT 20   O -	
Code 1076-409-1203-00-22					

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
  - Constitution and treatment goals of WWTP
  - 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 homogenization
  - Coagulation and flocculation
  - Sedimentation and Flotation
  - water softening and water stabilization
  - 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. Chaubey, M. 2021. Wastewater Treatment Technologies: Design Considerations. Challenges of Water Management. Wiley Blackwell.
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 2013. Wastewater engineering. Treatment and reuse. 5th edition, McGraw-Hill, New York, 2048 p.
5. Monte, H. M. ; Santos, M. T. L. ; BARREIROS, A. M. 2018. Tratamento de águas residuais: processos de tratamento biológico. ERSAR; ISEL. Lisboa

### 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			
Manuel Joaquim Sabença Feliciano	Amílcar António Teiga Teixeira	Manuel Joaquim Sabença Feliciano	Maria Sameiro Ferreira Patrício
16-12-2022	16-12-2022	19-12-2022	19-12-2022

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