

Course Unit	Effluent and Waste Treatment	Field of study	Environmental protection technology
Bachelor in	Food Engineering	School	School of Agriculture
Academic Year	2023/2024	Year of study	3
Type	Semestral	Semester	2
Level	1-3	ECTS credits	6.0
Code	9087-641-3205-00-23		
Workload (hours)	162	Contact hours	T - TP - PL - TC - S - E - OT - 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. Know and plan the physical, chemical and biological unit processes used in the treatment and recovery of waste and effluents;
2. Understand the fundamentals of waste and effluent management resulting from the Food Industry;
3. Know the main legislative documents and standards related to waste and effluents.

#### Prerequisites

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

#### Course contents

1. Effluents and waste in the food sector. 2. Conventional effluent treatment methods. 3. Gaseous emissions and effluents. 4. Solid waste. 5. Food processing byproducts. 6. Legislation and environment management systems. 7. Case Studies in the food industry.

#### Course contents (extended version)

1. Effluents and waste in the food sector.
  - Characterization
  - Key legislation
  - Fundamentals of physico-chemical and biological processes used in effluents and waste treatment
2. Conventional effluent treatment methods.
  - Preliminary, primary, secondary and tertiary treatment
  - Sludge treatment and disposal
3. Gaseous emissions and effluents
  - characterization
  - treatment methods
4. Solid wastes.
  - Characterization
  - Collection and transport
  - Treatment, recycling, valuation and elimination
5. Food processing byproducts.
6. Legislation and economical aspects of effluents and waste management.
7. Case Studies in the food industry.

#### Recommended reading

1. Metcalf and Eddy (2014). Wastewater Engineering – Treatment and Resource Recovery (5<sup>a</sup> ed. ), McGrawHill, Inc. , New York.
2. Galanakis, C. M. (2015). Food Waste Recovery: Processing Technologies and Industrial Techniques, Elsevier
3. Waldron, Keith (2007). Handbook of waste management and coproduct recovery in food processing Vol. 1, Woodhead Publishing Limited, Cambridge.
4. Kreith, F. , Tchobanoglous G. (2002). Handbook of Solid Waste Management (2<sup>ed</sup>), McGrawHill
5. Heinesohn R. e Kabel R. (1999). Sources and control of air pollution. Prentice Hall.

#### 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)
  - Final Written Exam - 70%
  - Practical Work - 30% (2 (two) practical group works: one about solid waste and another about wastewater treatment.)
2. Alternative 2 - (Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 70%
  - Practical Work - 30% (2 (two) practical individual work or practical exam)

#### Language of instruction

Portuguese, with additional English support for foreign students.

#### Electronic validation

Amílcar António Teiga Teixeira, Maria Sameiro Ferreira Patrício	Manuel Joaquim Sabença Feliciano	Elsa Cristina Dantas Ramalhosa	Maria Sameiro Ferreira Patrício
23-01-2024	27-01-2024	28-01-2024	29-01-2024