

Course Unit	Food Chemistry Laboratories	Field of study	Chemistry
Bachelor in	Food Engineering	School	School of Agriculture
Academic Year	2023/2024	Year of study	1
Type	Semestral	Semester	2
Level	1-1	ECTS credits	6.0
Code	9087-641-1204-00-23		
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) Maria Fátima Alves Pinto Lopes da Silva, Vitor Manuel Ramalheira Martins

#### Learning outcomes and competences

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

1. To know hydrolysis reactions in organic compounds (biomolecules: carbohydrates, proteins, and lipids);
2. To understand the importance of sampling and food sample preparation in the quality of analytical results;
3. To know some chemical analysis techniques (volumetry, gravimetry, potentiometry, chromatography, and spectrophotometry) applied to food samples;
4. To understand the basic principle and instrumentation of the analytical chemistry techniques;
5. Research, select, and establish adequate analytical procedures.

#### Prerequisites

Before the course unit the learner is expected to be able to: possess basic knowledge of Chemistry and Biochemistry.

#### Course contents

Hydrolysis reactions of organic compounds. Introduction to analytical techniques. Methods for chemical analysis of food: volumetric methods, gravimetric methods, potentiometric methods, optical methods, and chromatographic methods.

#### Course contents (extended version)

1. Hydrolysis reactions of organic compounds:
  - Hydrolysis of lipids, proteins, and carbohydrates;
  - Impact in food characteristics and stability.
2. Introduction to the analytical methods:
  - Classification of analytical methods;
  - Characteristics and selection of analytical methods;
  - Calibration of analytical methods (external and internal standard, and standard addition methods).
3. Volumetric methods:
  - Definitions;
  - Acid-base titrations, complexometric titrations, and precipitation titrations.
4. Gravimetric methods:
  - Steps of a gravimetric analysis;
  - Gravimetric calculations;
  - Examples of gravimetric analysis.
5. Potentiometric methods:
  - General principles;
  - Reference and indicator electrodes;
  - Direct potentiometry;
  - Potentiometric titrations.
6. Spectrophotometric methods:
  - General principles and instrumentation;
  - Atomic spectroscopy (absorption and emission);
  - Molecular absorption spectrometry (UV-VIS and IR).
7. Chromatographic methods:
  - General principles;
  - Thin layer chromatography;
  - Gas chromatography;
  - Liquid chromatography.
8. Preparation of food samples and practical application of the previous techniques to their analysis.

#### Recommended reading

1. G. D. Christian, Analytical Chemistry, 5 Edition, John Wiley & Sons, New York, 1994;
2. D. A. Skoog, D. West, F. J. Holler Fundamentals of Analytical Chemistry, 7th Edition, Brooks Cole, New York, 1995;
3. D. Harvey, Modern Analytical Chemistry, McGrawHill, 2000;
4. Normas portuguesas e Internacionais relativas à análise química de géneros alimentícios.
5. Belitz, H. -D. ; Grosch, W. (1992). Química de los Alimentos. Editorial Acribia.

#### Teaching and learning methods

Theoretic-practical lessons involve presentation, solving and discussion of theoretical/practical exercises. Laboratory lessons will consist in the use of experimental protocols, based in the various techniques approached in the theoretical lessons, for the determination of analytical parameters in foodstuffs.

#### Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
  - Final Written Exam - 75% (minimal grade of 8, 0 values (in a total of 20 values))
  - Reports and Guides - 25% (without minimal grade)
2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
  - Final Written Exam - 100% (This exam will evaluate the totality of the theoretical and practical topics.)

**Language of instruction**

Portuguese, with additional English support for foreign students.

**Electronic validation**

Maria Fátima Alves Pinto Lopes da Silva, Vitor Manuel Ramalheira Martins	Maria da Conceição Constantino Fernandes	Elsa Cristina Dantas Ramalhosa	José Carlos Batista Couto Barbosa
22-01-2024	01-02-2024	12-02-2024	12-02-2024