

Course Unit	Pharmaceutical Chemistry	Field of study	-
Bachelor in	Pharmacy	School	School of Health
Academic Year	2023/2024	Year of study	2
Type	Semestral	Semester	2
Level	1-2	ECTS credits	4.0
Code	9549-803-2204-00-23		
Workload (hours)	108	Contact hours	T - TP 22,5 PL 30 TC - S - E - OT 7,5 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) Luíís Avelino Guimarães Dias, Miguel José Rodrigues Vilas Boas

### Learning outcomes and competences

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

1. To understand the importance of a sampling plan and the preparation of the sample.
2. Interpreting the results of analytical chemistry by using statistic.
3. To understand and apply the theoretical concepts of analytical methods of separation.
4. To know the instrumentation of various analytical methods and understand the physical principle that serves as basis for the analytical technique.
5. To understand the advantages and disadvantages of each technique and identify the capabilities and quantitative techniques.
6. To plan and prepare laboratory experiments.
7. To acquire critical analytical capability and integration of knowledge in laboratory work.

### Prerequisites

Not applicable

### Course contents

Sampling and treatment of the sample. Chromatographic methods: liquid chromatography, gas chromatography, thin-layer chromatography and ion chromatography. Capillary electrophoresis. Mass spectroscopy.

### Course contents (extended version)

1. Sampling and preparation of sample for analysis:
  - Importance of sampling.
  - Design a sampling plan.
  - Implement a sampling plan.
  - Separation of analyte of interferences.
  - General theory of separation.
2. Classification of separation techniques:
  - Separation based on size
  - Separations based on weight or density
  - Separations based on complexation
  - Separations based on the change of state
  - Separations based on the partition between phases
  - Liquid-liquid and solid-liquid extraction.
3. Chromatographic methods:
  - Chromatographic separations.
  - Classification of analytical separations.
  - Classification of chromatography columns.
  - Chromatographic parameters.
  - Parameters that affect the efficiency of separation.
4. Gas chromatography:
  - Stationary phases.
  - Mobile phase.
  - Injection.
  - Control of temperature.
  - Detectors.
  - Qualitative and quantitative applications.
5. Liquid chromatography:
  - Stationary phases.
  - Mobile phase.
  - HPLC pumps.
  - Injection.
  - Detectors.
  - Qualitative and quantitative applications.
6. Other chromatographic methods:
  - Thin-layer chromatography.
  - Ion chromatography.
  - Qualitative and quantitative applications.
7. Capillary electrophoresis:
  - Instrumentation.
  - Qualitative and quantitative applications.
8. Mass spectroscopy:
  - Fundamentals of mass spectroscopy.
  - Equipment description.
  - Coupling to LC and GC.
  - Interpretation of mass spectra.
  - Application in the study of impurities on drugs.

### Recommended reading

1. Hansen, S., Pedersen-Bjergaard, S., Rasmussen, K. (2012). Introduction to Pharmaceutical Chemical Analysis. Wiley. John Wiley & Sons, Ltd, Publication
2. Waksmondzka-Hajnos, M., Sherma, J. (2011). High Performance Liquid Chromatography in Phytochemical Analysis. CRC Press
3. Cazes, J. (2009). Encyclopedia of Chromatography. CRC Press
4. Ahuja, S. & Rasmussen, H. (2007). HPLC Method Development for Pharmaceuticals. Academic PreSatinder Ahujass
5. Hoffmann, E., Stroobant, V. (2007). Mass Spectrometry. John Wiley & Sons, Ltd

**Teaching and learning methods**

Lectures for the acquisition of concepts of analytical chemistry and instrumental methods of analysis. Practical/theoretical-practical lessons of: problem-solving and analytical application of theoretical concepts, practical implementation of laboratory work and developing an analytical method using a scientific article. Preparation of reports of practical work.

**Assessment methods**

1. Assessment 1 - (Regular, Student Worker) (Final, Supplementary)
  - Final Written Exam - 70% (Assessment of knowledge acquired.)
  - Development Topics - 30% (The practical component will be measured with the development of an analytical project.)
2. Assessment 2 - (Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 100% (Assessment of knowledge acquired.)
3. Assessment 3 - (Regular) (Special)
  - Final Written Exam - 100% (Assessment of knowledge acquired.)

**Language of instruction**

Portuguese

**Electronic validation**

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16-05-2024	27-05-2024	27-05-2024	31-05-2024