

Course Unit	Option I	Field of study	-		
Master in	Technology and Animal Science	School	School of Agriculture		
Academic Year	2015/2016	Year of study	1	Level	2-1
Type	Semestral	Semester	1	ECTS credits	6.0
		Code	5026-453-1105-02-15		
Workload (hours)	162	Contact hours	T 30	TP -	PL 24
			TC -	S 6	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) Luís Avelino Guimarães Dias

#### Learning outcomes and competences

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

1. To interpret the results of analytical chemistry by using the statistic.
2. To understand, apply the theoretical concepts of analytical chemistry and use the quality control in analytical measurement results.
3. To know the instrumentation of various analytical methods and understand the physical principle that serves as basis for the analytical technique.
4. To understand the advantages and disadvantages of each technique and identify the qualitative and quantitative capabilities of each technique.
5. To plan, prepare laboratory experiments and apply the various methods of calibration.
6. To acquire critical analytical capability and integration of knowledge in laboratory work.

#### Prerequisites

Before the course unit the learner is expected to be able to:

1. Descriptive statistics and linear regression.
2. Acid-base, precipitation, oxidation-reduction and complexation reactions.
3. Intermolecular interactions and molecules polarity.
4. Nomenclature and typical organic reactions.
5. Electricity concepts.

#### Course contents

Fundamentals of instrumental analysis. Methods of spectroscopy. Electrochemical methods. Methods of separation.

#### Course contents (extended version)

1. Fundamentals of instrumental analysis:
2. Infrared absorption spectroscopy:
  - Fundamentals of spectroscopy.
  - Infrared absorption and vibrational interactions.
  - Characteristic bands of organic compounds,
  - Interpretation of spectra.
  - FTIR - Instrumentation.
  - Techniques of analysis of samples and applications.
  - Quantitative and qualitative applications.
  - Advantages and disadvantages of each technique.
3. Methods of separation:
  - Fundamentals of analytical separations.
  - Gas chromatography.
  - Liquid chromatography.
  - Thin-layer chromatography.
  - Instrumentation of each technique.
  - Maintenance of chromatographic columns. Recovery of columns.
  - Quantitative and qualitative applications.
  - Advantages and disadvantages of each technique.
  - General techniques of extraction of compounds for analysis.
  - Applications with SPE, SPME and SBSE.

#### Recommended reading

1. P. Patnaik, Deans's Analytical Chemistry Handbook, McGraw-Hill, 2004
2. J. Kenkel, Analytical Chemistry for Technicians, CRC Press, 2003
3. J. Cazes, Encyclopedia of Chromatography, CRC Press, 2001
4. B. C. Smith, Fundamentals of Fourier Transform Infrared Spectroscopy, CRC Press, 2011
5. R. L. Grob, E. F. Barry, Modern Practice of Gas Chromatography, Wiley-Interscience, 2004

#### 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 - 75% (Assessment of knowledge acquired.)
  - Laboratory Work - 25% (The practical component will be evaluated taking into account the evaluation of written reports.)
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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10-01-2016	28-01-2016	28-01-2016