UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
IMPH-108	Analytical Chemistry/Αναλυτική Χημεία	5
Prerequisites	**Department**	**Semester**
None	Health Science	Fall/Spring
Type of Course	**Field**	**Language of Instruction**
Compulsory	Pharmacy	Greek/English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Dr Christou Stavroula/ Dr Maria Savva	1st
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-face	N/A	N/A

Course Objectives:

The main objectives of the course are to:

- acquire the ability to think analytically
- demonstrate analytical skills
- sketch an analytical scheme and use it
- use analytical instruments to help solve analytical problems
- interpret analytical data

Learning Outcomes:

After completion of the course students are expected to be able to:

- Understand and be able to apply the fundamental principles of analytical chemistry
- Logically approach analysis and execute appropriate strategies to overcome problems encountered in quantification of sample species
- Demonstrate an understanding of the application of and use of different methods of analysis
- Competently undertake advanced qualitative and quantitative laboratory tasks
- Demonstrate the ability to follow the analytical approach to the solution of problems in chemical analysis and adhere to good laboratory practice

- Be able to present and interpret scientific data in a clear, concise and unambiguous manner
- Be able to understand and follow standard documented methods of analysis
- Appreciate the fundamental concepts of modern analytical science
- Understand the process of an analysis from instrument calibration and sample preparation to data analysis
- Discuss the principles of gas and liquid chromatography and atomic and molecular spectroscopy
- Prepare samples
- Apply statistical techniques to quantitative data
- Describe an analytical scheme
- Use analytical instruments to help solve analytical problems
- Interpret and handle analytical data

Course Content:

1. Introduction; the language of analytical chemistry

2. Chemical equilibrium; reaction rates; equilibrium constant; le Châtelier's principle; activity effects; mass balance equation; charge balance equation; proton balance equation

3. Acid-base equilibria; strong and weak acids and bases; water ionization; buffer solutions

4.Qualitative analysis of cations and anions; reactions, separation, identification of cations and anions in mixtures, alloys and/or minerals

5. Titrimetric methods of analysis; equivalence and end points; titration curves

6. Titrations based on acid–base reactions; acid-base titration curves; qualitative and quantitative applications

7. Formation of complexes; formation constant, K_f; titrations based on complexation reactions; complexiметric EDTA titrations; quantitative applications

8. Redox reactions; electrochemical cells; redox equilibria and standard electrode potentials; the Nernst equation; titrations based on redox reactions; redox titration curves; quantitative applications.

9. Precipitation reactions; solubility product, K_{sp}; ion product, Q_s; solubility equilibrium; precipitation titrations; titration curves; quantitative applications

10. Gravimetric analysis; steps and procedure; mechanism of precipitation

11. Introduction to instrumental analysis; spectroscopic, electrochemical, and chromatographic analytical techniques

Laboratory work:

1. Experimental determination of K_{sp}, of the insoluble electrolyte $Ca(OH)_2$
2. Detection of Analytical Cation Group I (Ag^+, Pb^{2+}, Hg_2^{2+})
3. Detection of Analytical Cation Group IV (Ca^{2+}, Ba^{2+}) - pyrochemical cation assay
4. Detection of Analytical anion groups I-V: CO_3^{2-} , $C_2O_4^{2-}$, SO_4^{2-} , CrO_4^{2-} , Cl^-, I^-, CH_3COO^-, NO_3^-, MnO_4^-
5. Assay of purity of aspirin in acetylsalicylic acid
6. Determination of total water hardness by complexation titration
7. Determination of divalent copper (Cu^{2+}) by the iodometric method
8. Determination of chlorides (Cl^-) by the Mohr method
9. Determination of sulfates (SO_4^{2-}) with Gravimetric Analysis

Learning Activities and Teaching Methods:

Final exam, Midterm exam, Lab reports and exam

Assessment Methods:

Final exam, Midterm exam, assignment

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Βασικές Αρχές Αναλυτικής Χημείας	Δημήτριος Γ. Θεμελής	Εκδόσεις Ζήτη	2012	960-456-357-2

Αναλυτική Χημεία: Θέματα και Προβλήματα	Στυλιανός Λιοδάκης	Εκδόσεις Παπασωτηρίου	2001	960-7510-86-0 http://www.lib.ntua.gr/gr/el_sources/ebooks/liodakis/index.htm
Χημική Ισορροπία και Ανόργανη Ποιοτική Ημιμικροανάλυση	Θ. Π. Χατζηϊωάννου	Ιδιωτική Έκδοση	2003	960-220-751-5
Βασικές αρχές Αναλυτικής Χημεία	Γ. Κ. Παρισάκη	Εκδόσεις Παπασωτηρίου	1996	
Pharmaceutical Analysis, A Textbook for Pharmacy Students and Pharmaceutical Chemists, 3rd Edition	David G. Watson.	Elsevier	2012	0702046213
Analytical Chemistry: An introduction, seventh edition	Skoog, West, Holler and Crouch	Barrosse	2000	0-03-020293-0