EASTERN MEDITERRANEAN UNIVERSITY
DEPARTMENT OF CHEMISTRY

COURSE CODE	CHEM247	**COURSE LEVEL**	Undergraduate	
COURSE TITLE	Analytical Chemistry I	**COURSE TYPE**	Faculty Core – Physical/Natural Sciences	
CREDIT VALUE	(3,2) 4	**ECTS VALUE**	6	
PREREQUISITES	CHEM105, MATH212	**COREQUISITES**	None	
DURATION OF COURSE	One semester	**Semester and year**	SPRING	**2022-2023**

WEB LINK	http://lms.emu.edu.tr/ follow the link for **CHEM247 Analytical Chemistry**			
Role	**Name**	**e-mail**	**Office**	**Telephone**
Instructor	Kıvanç YÜNEY	kivanc.yuney@emu.edu.tr	AS230	630 2408
Instructor				
Lab Instructors	Cahit ÖZBİLENLER	cahit.özbilenler@emu.edu.tr	AS225	630 1064
	Selma USTÜRK	selma.usturk@emu.edu.tr	AS233	630 2846
	Namık Refik KERKÜKLÜ	namik.kerkuklu@emu.edu.tr	AS225	630 1064

CATALOGUE DESCRIPTION

CHEM247 Analytic Chemistry I (3,2)

Classification of analytical methods. Tools of analytical chemistry: terminology, apparatus, chemicals and stoichiometric calculations. Sampling and sample treatment. Types and sources of errors in measurements and statistical treatment of data: error, accuracy, precision, confidence intervals and significance. Aqueous chemical equilibrium: acids, bases, buffer solutions, solubility and complexation. Ionic strength and activity. Classical/wet chemical methods of analyses: different types of gravimetric (precipitation, volatilization etc.) analyses and volumetric/titrimetric (neutralization, precipitation and complexation) methods of analyses.

AIMS & OBJECTIVES

This course is the first of the two Analytical Chemistry courses offered to Pharmacy students. It aims to help the student to develop:
- a rigorous background knowledge in the fundamentals of classical chemical analyses,
- theoretical and practical skills in statistics for analyzing, processing and evaluating raw experimental data to assess accuracy and precision,
- knowledge of equilibrium reactions in aqueous solutions,
- the ability to quantitatively evaluate ionic strength, activities and solution equilibria,
- knowledge and familiarity with a wide range of classical analytical techniques,
- practical laboratory skills in the use and application of chemical/wet techniques, and acquisition of high-quality analytical data,
- systematic problem-solving skills through conceptual and numerical problems requiring critical and analytical thinking skills,
- skills to present the results of analyses in a coherent and clear manner.

LEARNING OUTCOMES.

On completion of this module, student should be able to:
- Summarise the different classes of analytical techniques/methods for qualitative, quantitative and structural analysis.
- Describe the correct use of the different grades of chemicals and the various apparatus used in analytical chemistry.
- Formulate and calculate results from measured quantities and relevant stoichiometric relationships.
- Describe and explain the chemical and procedural principles of GRAVIMETRIC and VOLUMETRIC methods of analysis.
- List potential sources of systematic and random errors and explain ways to avoid or minimize them.
- Find and select an established analytical method appropriate for the analysis of an analyte in a specified matrix.
- Describe how to obtain a representative sample and prepare it for analysis by the method selected.
- Carry out the selected analysis and record the raw data obtained.
- Apply appropriate statistical treatment to the raw data and report results with estimates of accuracy and precision.
- Write a lab report for the analysis and present results in concise and comprehensible format.
- Use symbols and units correctly.
- Handle all chemicals and apparatus correctly and safely in the laboratory.
- Use correct scientific English for written and oral communication.

GRADING CRITERIA	
A **(excellent)** **~85% and above**	Excellent understanding of the concepts and the principles as demonstrated by correct and accurate knowledge and excellent application of practical skills in conducting experiments. Response to problems and written reports are clear, legible, concise and accurate. Experimental data is high quality and accurate. Excellent performance.
B **(good)** **~70% and above**	Better than average understanding of the concepts and the principles as demonstrated by correct and accurate knowledge and application of practical skills in conducting experiments but does not have the depth and outstanding quality of an "A". Response to problems is fairly clear, legible, but occasionally contains some inaccuracies. Practical skills occasionally falter. Performance exceeds the minimum requirements.
C **(average)** **~60 % and above**	An average understanding of the concepts and the principles as demonstrated by reasonably correct knowledge and application of practical skills in conducting experiments but does not have any depth. Response to problems is reasonably clear, legible, but contains inaccuracies and lacks depth. Similarly, experimental skills and data are of average quality. Content and skills do not go beyond basic expectations and/or display some substantial errors. Acceptable but non-exceptional performance that does not go much beyond the minimum requirements.
D **(barely sufficient)** **~50% and above**	Minimal knowledge and barely sufficient understanding of the concepts and the principles as demonstrated by approximately correct application of theory/laws in solving problems and minimal mastery of experimental skills and data gathering. Response to problems and reports of experiments is unclear and barely legible and contain many inaccuracies. Minimum (confused) understanding of the material, and lack of mastery in application. Content and skills do not adequately meet the basic expectations, and/or display significant errors. Performance demonstrates severe problems in one or more areas.
F **(fail)** **Below 35%**	Work and skills do not meet the minimal standards. No understanding of the material, lack of basic academic and practical skills and knowledge, or completely incomprehensible writing. Performance is not acceptable.
NG **nil grade**	Not enough information to assign a letter grade. Conditions that will lead to NG grade. i) Not attending any two exams (midterm, final or lab final), including make-up exams. ii) Not attending 2 or more lab sessions. iii) Less than 50% attendance

RELATIONSHIP WITH OTHER COURSES

The course draws on concepts and theories from General Chemistry (CHEM105) and Biostatistics (MATH212).

EXAMS (See Grading Criteria)

1. There will be one Midterm exam with a weight of 30 % and a final exam worth 50 %. Exam results will be announced the student portal.
2. All students should have a non-programmable scientific calculator for use in exams.
3. **Mobile phones may not** be used in the exams as a calculator.

MAKE-UP EXAM

- A student who **misses Midterm or Final exams will BE allowed to take the MAKE UP exam in one session**.
- A student who **misses both Midterm and Final exams will BE allowed to take the MAKE UP exam in one session**.
- There will be a **single make-up session** for only **one makeup exam** or **two makeup exam**.
- **The makeup exams are scheduled in the week immediately following the Final Exams.**
- No medical report is needed to attend the make-up exam.
- **There will be NO MAKE-UP of the make-up exams!**
- Students **CAN NOT** attend make-up exams to improve their existing exam marks.

RESIT EXAMS

Those with a letter grade of -D or F can sit in resit exams. Also, those having an academic standing of "Warning" (irrespective of letter grade) can also sit in the resit exam. Online application is necessary. Resit exam mark replaces the sum of the marks of midterm and final exams (80% in CHEM247). Students with an NG grade are not allowed to take resit exams.

Cautionary Note:

- We strongly recommend students **not to miss the regular scheduled exams**!
- **There will be no make-up exam for Lab final exam.**

OBJECTIONS

Students' may inspect their marked exam papers online. Should a student have objections regarding their marks, in accordance with the by-laws, a written objection must be made to the instructor within 10 days of announcement of marks. If unsatisfied by instructors' response, the student can petition the head of the department

ATTENDANCE

- **Lectures:** The students are expected to attend all the lectures (minimum %50 attendance). Failure to fulfill this criterion **WILL** result with an "NG" grade. (See the Grading Criteria). Attendance is checked regularly.
- **Labs: Laboratory work is compulsory.** A student failing to attend less than four labs will receive the **NG** grade.

- Any student who misses one Midterm and the Final, or makeup exam of Midterm and Final, will receive the **NG** grade .
- Any student who misses any two labs (experiments) will receive the **NG** grade.
- ***A student who has fulfilled the attendance obligation of a course once, and whose latest transcript grade for that course is not NG or W, will not be required to fulfil the attendance criteria again.***

METHOD OF ASSESSMENT

Midterm Exam	**30 %**
***Laboratory work**	**20 %**
Final	**50 %**
TOTAL	**100 %**

* Pass mark in **Lab** is a minimum of **7 out of 20 (**and a minimum of 4 completed experiments). Students who are repeating CHEM247 and have passing Lab marks can transfer their marks and be exempted form Lab. Students who do not apply for exemption and do not attend Lab sessions will fail the whole of CHEM247 course with an NG grade!

TEXTBOOK/S

MAIN: Fundamentals of Analytical Chemistry (10th edition, 2022) by Skoog, West, Holler and Crouch. Pub Brooks/Cole Cengage Learning
SUPPLEMENTARY: **Statistics and Chemometrics for Analytical Chemistry** (6th Edition, 2010) by J. Miller and J. Miller, Pearsons.
Analytical Chemistry 2.1 (2016) by David Harvey, dpuadweb.depauw.edu/harvey_web/etextproject/AC2.1Files/AnalChem2.1.pdf

LEARNING / TEACHING METHOD

- Regular Face to face lectures and tutorials.
- Online self-study materials
- Weekly face-to-face or online laboratory sessions
-

ASSIGNMENTS
A lab report should be submitted after each lab session and should be handwritten.
Students who fail to submit their report after the lab session (on lab submission date), will not receive any marks for those experiments.

COURSE CONTENT AND LECTURE SCHEDULE

Week		**Topics**
1-2	01-10 March 23	The Nature of Analytical Chemistry(Chapter 1), and Chemicals, Apparatus and Unit Operations (Chapter 36)
3	13 -17 March 2023	Calculations used in Analytical Chemistry (Chapters 2)
4	20 -24 March 2023	Precision and Accuracy in Chemical Analysis (Chapter 3)
5	27 -31 March 2023	Random Errors in Chemical Analysis (Chapter 4)
6	03 – 07 April 2023	Statistical Data Treatment and Evaluation (Chapter 5)
7	10 – 14 April 2023	Statistical Data Treatment and Evaluation (Chapter 5) Aqueous Solutions and Chemical Equilibria (Chapters 7)
8	17 – 20 April 2023	Aqueous Solutions and Chemical Equilibria (Chapters 7)
9-11	24 April 23 – 08 May 23	**Mid-Term Exams**
11	09 – 12 May 2023	Effect of Electrolytes on Chemical Equilibria (Chapters 8)
12-13	15 – 26 May 2023	Effect of Electrolytes on Chemical Equilibria (Chapters 8) Gravimetric Methods of Analysis (Chapter 10)
14	29 May 2023 – 02 June 2023	Titrations in Analytical Chemistry (Chapter 11)
15	05 – 08 June 2023	Principles of Neutralization Titration(Chapter 12)
16-18	12 – 26 June 2023	**FINAL EXAMS**

PLAGIARISM and ACADEMIC HONESTY

CHEM247-SPRING-2022-2023 LABORATORY SCHEDULE

Experiment	**Group-1 Tuesday 08:30-10:20**
Lab Rules and Regulations	07 March
Experiment-1	14 March
Experiment-2	28 March
Experiment-3	11 April
Experiment-4	09 May
Experiment-5	23 May
LAB MAKEUP SESSION	TO BE ANNOUNCED
LAB FINAL EXAM	TO BE ANNOUNCED

CHEM247-SPRING-2022-2023 TUTORIAL SCHEDULE

Tutorial	**Group-1 Tuesday 08:30-10:20**
Tutorial 1	07 March
Tutorial 2	21 March
Tutorial 3	04 April
Tutorial 4	18 April
Tutorial 5	16 May
Tutorial 6	30 May