Jordan University of Science and Technology

Faculty of Pharmacy

Applied Cosmetic Sciences Department

AC101 Analytical Chemistry - JNQF Level: 7

Second Semester 2025-2026

Course Catalog
2 Credit Hours. This course aims to introduce students to the basic principles of analytical chemistry and its methods in identifying and quantifying chemical substances. The course covers the fundamentals of qualitative and quantitative analysis, along with major classical and instrumental methods used in sample analysis. It also emphasizes on applications of analytical chemistry in the field of cosmetics. A unique feature of the course is that introduces what AI means in analytical and instrumental analysis, and how it can support data processing and result interpretation.
Teaching Method: On Campus

Text Book	
Title	Analytical Chemistry,
Author(s)	Gary D. Christian.
Edition	7th Edition
Short Name	Ref #1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref #2	Analysis of Cosmetic Products	A. Chisvert & A. Salvador	2nd Edition	https://www.fda.gov/cosmetics/resources-consumers-cosmetics/cosmetics-qa-why-are-cosmetics-not-fda-approved

Instructor	
Name	**Dr. Rand Al-Waqfi**
Office Location	P1L4
Office Hours	
Email	raalwaqfi@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Mon, Wed : 13:30 - 14:30 Room: M3305

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	Introduction to analytical chemistry in cosmetics; analytical workflow; role in QC and safety. Map analytical steps to cosmetic lifecycle	From **Ref #1**, From **Ref #2**
Week 2	Introduction to analytical chemistry Map analytical steps to cosmetic lifecycle	From **Ref #1**, From **Ref #2**
Week 3	Data quality: accuracy/precision, calibration, statistics; uncertainty. LO: Compute LOD/LOQ, RSD; basic stats	From **Ref #1**
Week 4	Data quality: Compute LOD/LOQ, RSD; basic stats.	From **Ref #1**
Week 5	Concentration expressions, solution prep, ppm/ppb; formulation math. LO: Prepare standard and sample solutions.	From **Ref #1**
Week 6	Concentration expressions: Prepare standard and sample solutions.	From **Ref #1**
Week 7	Acid-base chemistry, buffers, pH in cosmetics.	From **Ref #1**
Week 8	Acid-base chemistry: Design buffers and perform pH profiling of products.	From **Ref #1**
Week 9	Titrimetry (acid-base, redox, complexometric). LO: Assay actives/preservatives; standardize titrants	From **Ref #1**
Week 10	Titrimetry (acid-base)	From **Ref #1**
Week 11	Titrimetry : (redox titration)	From **Ref #1**
Week 12	Titrimetry: complexometric including Assay actives/preservatives; standardize titrants	From **Ref #1**
Weeks 13, 14	Introduction to AI technology and Revolutionizing Analytical Chemistry: The AI Breakthrough	
Week 15	Artificial Intelligence as a Scientific Copilot in Analytical Chemistry	
Week 16	Cosmetic Case studies and future trends	**A** From **Ref #2**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Explain the theoretical principles underlying quantitative calculations, pH, and buffer systems used in cosmetic formulations and regulatory compliance [1L7K1]	15%	
Apply titrimetric analytical techniques (acid?base, redox, and complexometric titrations) to the quantitative analysis of cosmetic ingredients and finished products [1L7S1]	20%	
Calculate quantities and concentrations relevant to cosmetic formulations, including dilution schemes, assay calculations, and buffer composition [1L7S1]	20%	
Interpret analytical data using basic statistical tools to evaluate quality, reproducibility, and compliance of cosmetic products [1L7C1]	15%	
Integrate artificial intelligence and chemometric tools into cosmetic analytical data for peak detection, spectral deconvolution, method optimization, and quality control decision-making [1L7C1]	15%	
Identify the requirements for reliable quantitative analysis of cosmetic products, including sampling, sample preparation, calibration, method validation, and quality control [1L7K1]	15%	

Relationship to NQF Outcomes (Out of 100%)		
L7K1	L7S1	L7C1
30	40	30

Policy

Generative Artificial Intelligence (Gen AI) Policy	Purpose of This Policy This policy outlines the acceptable and prohibited uses of Generative Artificial Intelligence (Gen AI) tools in this course. The purpose is to maintain academic integrity, ensure authentic student learning, and promote responsible and ethical use of emerging technologies. General Principle Gen AI tools (such as ChatGPT or similar systems) may be used for clarification of concepts, brainstorming ideas, or improving understanding of course material. However, Gen AI tools are not considered reliable academic sources and must not replace independent critical thinking, research, or original writing. Permitted Uses Students may use Gen AI tools for the following purposes: Clarifying difficult concepts or terminology. Generating study questions for revision. Brainstorming ideas before drafting assignments. Improving grammar after completing their own original draft. Any use of Gen AI must support not substitute the student's own intellectual work. Prohibited Uses The following uses are strictly prohibited: Submitting assignments, essays, reports, or projects generated fully or partially by Gen AI. Copying, paraphrasing, or slightly modifying AI-generated content and presenting it as original work. Using AI tools to complete assessments intended to measure individual knowledge and skills. Assignments that are pre-made, generated, or copied from AI systems constitute a breach of academic integrity. Academic Integrity Submitting AI-generated work as one's own is considered academic misconduct. Such actions violate university academic integrity policies and may result in disciplinary action, including grade penalties, assignment failure, course failure, or further institutional consequences. Student Responsibility Students are responsible for ensuring that all submitted work reflects their own understanding, analysis, and academic effort. When in doubt about acceptable AI use, students must consult the course instructor before submission. Policy Acknowledgment By remaining enrolled in this course and submitting assignments, students acknowledge that they understand and agree to comply with this Gen AI policy.

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