



Course Specifications

Course Title:	Advanced Analytical Chemistry
Course Code:	541CHEM-2
Program:	Master of Science in Chemistry
Department:	Chemistry
College:	Science
Institution:	King Khalid University

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A. Course Identification

1. Credit hours: 2
2. Course type a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: Level 1 / Year 1
4. Pre-requisites for this course (if any): No prerequisite
5. Co-requisites for this course (if any): No co-requisite

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	2	100%
2	Blended	0	0
3	E-learning	0	0
4	Correspondence	0	0
5	Other	0	0

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	15
2	Laboratory/Studio	0
3	Tutorial	15
4	Others (specify)	0
	Total	30
Other Learning Hours*		
1	Study	30
2	Assignments	30
3	Library	15
4	Projects/Research Essays/Theses	15
5	Others (specify) Present a communication and poster	10
	Total	100

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

- Advanced Analytical Chemistry course is divided into major two parts sampling and data analysis.
- The course includes nine chapters.
- Concentration Units,
- Uncertainties in Measurements (Significant Figures, SF);
- Errors in Chemical Analysis (accuracy, precision,
- systematic error random error);



- Statistics in Analytical Chemistry (t-test, F-test, Q-test);
- Sampling and samples preparation;
- How to select an appropriate analytical method;
- Analytical method validation based on IUPAC guidelines;
- Chemometrics:
- Highlighting Experimental Design
- Writing a research report and scientific paper from one of text books.
- Presenting research: how to prepare and present (oral) a communication on research proposals and research findings for a defense for awarding an academic degree, forum, conferences, etc.

2. Course Main Objective

The aim of the course is to enable students to understand the sampling methods, writing scientific report and carrying out statistical analysis. The course emphasizes on sampling and samples preparation. Moreover, selecting an appropriate analytical method and analytical method validation based on IUPAC guidelines and defining chemometric and writing scientific papers are also main part of this course.



3. Course Learning Outcomes

CLOs		Aligned-PLOs
1	Knowledge:	
1.1	To demonstrate knowledge of expressing concentration units and conversion between concentration units.	K1, K2
1.2	To outline the steps of correct sampling procedure	K3
1.3	To know how to select an appropriate analytical method	K1, K3
2	Skills :	
2.1	Analyze the results and make the proved conclusions based on statistical analysis.	S1, S3
2.2	To distinguish the weakness and strengths of chemometric	S3
2.3	To comply with the standards of the preparation of publications	S4
3	Competence:	
3.1	To motivate the students to ask any questions related to the course content	C2, C3, C4
3.2	To interact positively with colleagues in a group work	C2, C3, C4
3.3	To develop of the student's ability to understand and treat with communication skills and the developed information technologies	C1, C3

C. Course Content

No	List of Topics	Contact Hours
1	Review on methods for expressing concentration units and conversion between concentration units	4
	Uncertainties in Measurements (Significant Figures, SF).	4
2	Errors in Chemical Analysis (accuracy, precision, systematic error random error)	3
3	Basics of statistics in Analytical Chemistry, confidence interval and uncertainty tests; t-test, F-test, Q-test	4
4	Sampling & samples preparation (Principles of sample dissolving and tools for various chemical analysis)	4
5	Analytical methods validation: How to select an appropriate analytical method: David Harvey: Modern analytical Chemistry.	4
6	Analytical method validation based on IUPAC guidelines	2
7	Chemometrics: Highlighting Experimental Design	2
8	How to write a research report & paper	3
Total		30



D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge		
1.1	To demonstrate knowledge of expressing concentration units and conversion between concentration units.	<ul style="list-style-type: none"> • Lectures • Classroom discussion 	Written exam
1.2	To know how to perform sampling		
1.3	To know how to select an appropriate analytical method		
2.0	Skills		
2.1	To analyze the results and make the proved conclusions based on statistical analysis.	<ul style="list-style-type: none"> • Lectures • Classroom discussion 	Homework
2.2	To distinguish the weakness and strengths of chemometric		Homework
2.3	To comply with the standards of the preparation of publications	<ul style="list-style-type: none"> • Lectures • Classroom discussion • Case study 	Homework
3.0	Competence		
3.1	To motivate the students to ask any questions related to the course content	<ul style="list-style-type: none"> • Lectures • Classroom discussion 	Oral presentation.
3.2	To interact positively with colleagues in a group work	<ul style="list-style-type: none"> • Lectures • Classroom discussion 	Poster presentation.
3.3	To develop of the student's ability to understand and treat with communication skills and the developed information technologies	<ul style="list-style-type: none"> • Lectures • Classroom discussion 	Report

2. Assessment Tasks for Students

#	*Assessment task	Week Due	Percentage of Total Assessment Score
1	Assignment, report	5 th	5
2	1st term Exam	7 th	20
3	2nd term Exam	11 th	20
4	Presentation	12 th	5
5	Final exam	16 th	50

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)



E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

10 office hours are offered for students for individual consultations. Communications are available on-site, phone conversations, and chatting by social media.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	D. Harvey, Modern Analytical Chemistry, McGraw-Hill Higher Education, 2 nd ed., 2000.
Essential References Materials	J. Miller, Statistics & Chemometrics for Analytical Chemistry, Trans-Atlantic Pubns Inc., 6 th ed., 2010. P. P. Quevauviller, C. Thompson, Analytical Methods for Drinking Water: Advances in Sampling and Analysis, Wiley & Sons, 4 th ed., 2005.
Electronic Materials	1. Microsoft Excel 2010 2. SPSS, version 13 Microsoft Power Point 2010
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation Classrooms, laboratories, demonstration) (.rooms/labs, etc	Classroom and computer lab
Technology Resources AV, data show, Smart Board, software.) (.etc	Accessible databases
Other Resources Specify, e.g. if specific laboratory) equipment is required, list requirements or (attach a list	-

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Course delivering	Student	Questionnaire
Course contents (update)	Plan and curriculum committee	Report
Teaching materials	Faculty	Meeting
Learning materials	Student	Discussion
Assignment	Program instructor and Faculty	Report
Exams	Program instructor and Faculty	Report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)



H. Specification Approval Data

Council / Committee	<u>Chemistry Department Council</u>
Reference No.	Session number 22
Date	27/04/2021M / 15/09/1442H

