Course Specification

(Postgraduate Programs)

Course Title:	**Statistical Methods of the Chemical Results**
Course Code:	**6220**
Program:	**Master of science in chemistry**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	*Course Specification Version Number*
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: 3 (2 Lectures, 1 Lab, 1 Tutorials)				
2. Course type				
A.	☐University	☐College	☐Department	☐Track
B.	☐Required		☒Elective	
3. Level/year at which this course is offered: Level 1/Year 2				
4. Course General Description:				
This course will cover Mean, Median, Precision, Measures of Precision, and Accuracy. The topics include types of Errors in Experimental Data, Gaussian curve, and Reporting Computed Data (Significant Figures and rounding data). It will extend to cover statistical data treatment, least square methods, Correlation Coefficient, and Detection Limits.				
5. Pre-requirements for this course (if any)**:**				
Advanced Analytical Chemistry - CHM 6131				
6. Pre-requirements for this course (if any)**:**				
7. Course Main Objective(s):				

- **Outline all aspects of Statistics in analytical chemistry.**
- **Acquisition of information on Mean, Median, Precision, Measures of Precision, and Accuracy.**
- **Develop awareness with types of Errors in Experimental Data.**
- **Be familiar with Reporting Computed Data and statistical data treatment.**

Recognize least square methods, Correlation Coefficient, and Detection Limits

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**60**	**100 %**
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**60**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)……**	**0**
	Total	60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To recall the principles of Statistics in Analytical Chemistry.**	**K1. Anal.; K2. Anal.; K4. Anal.**	▪ **Five hours/week lectures.** ▪ **Self-study Home-exam.**	▪ **Regular Exams** ▪ **Assignments** ▪ **Short Quizzes** ▪ **Oral Discussion Participation.**
1.2	**To recognize basic principles of Mean, Median, Precision, Measures of Precision, and Accuracy.**	**K1. Anal.; K2. Anal.; K4. Anal.**	▪ **Five hours/week lectures.** ▪ **Think and justify the Mean, Median, Precision, Measures of Precision, and Accuracy principles using available references (SDL) online.** **Open discussion.**	▪ **Oral Discussion marks** ▪ **Literatures Survey** ▪ **Mini-seminar.** **Participation**
1.3	**To outline the types of Errors in Experimental Data that arise.**	**K1. Anal.; K2. Anal.; K4. Anal.**	▪ **Five hours/week lectures.** **Group Discussion to justify types of Errors in Experimental**	▪ **Midterm.** ▪ **Assignments.** ▪ **Group Discussions.** ▪ **Literatures Survey**

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			Data using available references (SDL) online.	▪ Mini-seminar. Participation.
1.4	To state the basic principles of Reporting Computed Data and statistical data treatment.	K1. Anal.; K2. Anal.; K4. Anal.	Five hours/week lectures. Group Discussion using available references (SDL) online.	Assignments Open Discussions. Literatures Survey Mini-seminar. Participation.
2.0	**Skills**			
2.1	To analyze data and interpret results by statistical methods for complex samples with different matrix constituents.	S1. Anal.; S2. Anal.; S3. Anal.	Lectures activity Self-study. Think, and discuss on analyzing and interpretation of statistical data for complex samples	Questions in Lectures. Short Quizzes and Exams. Open Discussions. Participation Mini -seminar.
2.2	To design experimental setup for computing data isolated.	S2. Anal.; S3. Anal.	Practice some examples for experimental setup of computing data isolated. Brainstorming. Self-study.	Questions in Lectures. Participation Oral Discussion Short Quizzes.
2.3	To justify Comparison of two measured values (Paired t-test)	S2. Anal.; S3. Anal.	Lectures Oral Discussions. Brainstorming. Self-study	Questions in Lectures. Short Quizzes and Exams. Oral Discussion. Participation.
2.4	To demonstrate Oral Communication to application of Statistics in analytical chemistry, accompanying writing of mini-Reports, operating electronic mail, and Network in	S1. Anal.; S3. Anal. S4. Anal.	Group Discussion and Assignments. Apply several examples of obtained results statistically to analyze, which will require reading, writing, and oral	Oral Discussion, Quizzes, and Exams. Giving marks for Oral Discussion in Lectures.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	communicating with others		presentation in groups. Encourage students to use electronic mail to submit Home Exams and Assignments	Marks given for Assignments
3.0	Values, autonomy, and responsibility			
3.1	To perform a scientific presentation, research, and work independently and integrate with a collaborated group, Using IT to acquire, analyze, and communicate information.	V1. Anal.	Brainstorming. Exercises Group Discussion. Team work.	Oral Discussion. Group Discussion Assignments.
3.2	To appraise effectively the collaboration and inter-professionalism in class discussions or team works, as well as independently.	V1. Anal.; V2. Anal.	Small Group tasks Open discussion at classroom. Office hour guiding. Group Presentation of mini-projects	Participation Homework's Mini-project(s).
…				

C. Course Content:

No	List of Topics	Contact Hours
1.	***Mean, Median, Precision, and Accuracy***	10
2.	***Types of Errors in Experimental Data (Systematic errors and Random errors), and Gaussian curve. A Measure of Precision:*** The standard deviation, the relative standard deviation (RSD), variance, the coefficient of variation (CV), and the spread.	10
3.	***Reporting Computed Data: Significant figures, Significant figures in numerical computations, and rounding data***	15

4.	***Statistical Data Treatment and Evaluation:*** Confidence intervals, confidence limits, Comparing an experimental mean with true value, Comparison of two measured values (Paired t-test), Rejection of outlier results (Q-test).	13
5.	***Least square methods, Correlation Coefficient, and Detection Limits***	12
Total		**60**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Class Activities (Open Discussion, Mini-reports, Oral Presentation, solving questions)**	**weekly**	**30 %**
2.	**Midterm Exams**	**9th and week**	**30 %**
3.	**Final Exam**	**Around 12th–17th week**	**40 %**
4.	**Total**		**100%**

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	***Fundamentals of analytical chemistry,*** Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch. 9th Edition. ISBN-13: 978-0-495-55828-6. ***Analytical Chemistry,*** Gary D. Christian, Purnendu K. (Sandy) Dasgupta, Kevin A. Schug.7th Edition. ISBN: 978-0-470-88757-8.
Supportive References	**NONE**
Electronic Materials	• Saudi Digital Library
Other Learning Materials	• Blackboard. • Multimedia associated with the text book and the relevant websites

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Each of the classroom should be equipped with a whiteboard and a projector, with a maximum of 20 students.**
Technology equipment (Projector, smart board, software)	**The rooms are equipped with data show, Smart Board, WI-FI access.**
Other equipment (Depending on the nature of the specialty)	**None**

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of students' assessment	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	Students	**Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory-GCC)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio.
	Course Responsible	**Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	Course Responsible	**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Program Leaders	**Indirect:** Exams.
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**Council of Chemistry Department**
REFERENCE NO.	**10 (No. 2/10)**
DATE	