

COURSE SPECIFICATIONS

Form

Course Title: **Statistical Analytical Chemistry**

Course Code: **4026814-3**



Date: 24-10-2018

Institution: Umm Al-Qura University.

College: Faculty of Applied Science

Department: Department of Chemistry

A. Course Identification and General Information

1. Course title and code: **Statistical Analytical Chemistry / 4026814-3**

2. Credit hours: **3 hrs.(Theoretical)**

3. Program(s) in which the course is offered. **M. Sc. in Chemistry**

(If general elective available in many programs indicate this rather than list programs)

4. Name of faculty member responsible for the course: **Prof. Amr Lotfy Saber**

5. Level/year at which this course is offered: **1st / 1st**

6. Pre-requisites for this course (if any): **not applicable**

7. Co-requisites for this course (if any): **not applicable**

8. Location if not on main campus: **El-Abedyah, El-Azizya, and El-Zaher**

9. Mode of Instruction (mark all that apply):

- | | | | |
|-------------------------------------|-------------------------------------|-------------|---------------------------------------|
| a. Traditional classroom | <input type="checkbox"/> | percentage? | <input type="checkbox"/> |
| b. Blended (traditional and online) | <input checked="" type="checkbox"/> | percentage? | <input type="checkbox" value="100%"/> |
| c. E-learning | <input type="checkbox"/> | percentage? | <input type="checkbox"/> |
| d. Correspondence | <input type="checkbox"/> | percentage? | <input type="checkbox"/> |
| f. Other | <input type="checkbox"/> | percentage? | <input type="checkbox"/> |

Comments:

B Objectives

1. The main objective of this course

By completing this course, the students will be familiar with:

- The statistical treatment and analysis of data.
- The uncertainties; calibrations; detection limits; interferences; quality control and assurance and validation of analytical methods
- How to classify sampling and physical state, sampling of liquids, gas and solids.
- Using probability distributions and confidence intervals for populations, probability distributions and confidence intervals for samples,
- Comparing between accuracy and precision: determinate errors, indeterminate errors, significant figures, standard deviation, propagation of errors, the confidence limit, tests of significance, rejection of a result, linear least squares, correlation coefficient and coefficient of determination, detection limits.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- Changes in content as a result of new research in the field.
- Increased use of IT or web based reference material.
- The use of smart teaching halls for lectures.
- Encourage students to carry out research reports in the statistical analytical chemistry related subjects using the library, data base services, and/or websites.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
The language of analytical chemistry: analysis, determination, and measurement, techniques, methods, procedures, and protocols, classifying analytical techniques, selecting an analytical method.	2	6
Statistical treatment and analysis of data: accuracy, precision, sensitivity, detection limit, limit of quantization, linearity, range, selectivity, selectivity coefficient, robustness and ruggedness.	2	6



Developing the procedure: calibration and standardization, populations and samples (probability distributions for populations, confidence intervals for populations, probability distributions for samples.	1	3
Confidence intervals for samples, sampling procedure, sampling and physical state, sampling of liquids, gas and solids, preparation of laboratory sample, moisture in samples and validation of analytical methods.	2	6
Significance testing, significant figures, errors in significance testing, propagation of uncertainty and characterizing experimental errors	1	3
Errors in chemical analysis, mean, median, classification of errors, determinate errors, indeterminate errors, absolute error, relative error, gross errors and Bias	1	3
Types of systematic errors (instrumental errors, chemical or method errors and personal errors).Difference between constant error and proportional error	1	3
The standard deviation, average deviation, propagation of errors, relative average deviation, rejection of a result, linear least squares, correlation coefficient and coefficient of determination.	1	3
The principal components of a quality assurance program: quality control and quality assessment.	1	3
Revision	1	3



2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	39	--	--	--	--	39
	Actual						
Credit	Planned	3	--	--	--	--	3
	Actual						

3. Individual study/learning hours expected for students per week.

3 hrs

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		
1.1	Recognize statistical treatment and analysis of data.	<ul style="list-style-type: none"> • Lectures • Scientific discussion • Library visits • Web-based study • Using open discussion to link the previous knowledge to the current and future topics • The students use the internet to prepare an essay about a recent advances related to the course 	<ul style="list-style-type: none"> • Exams • web-based student performance systems • portfolios • long and short essays
1.2	Identify parameters such as analysis, determination, measurement, techniques, methods, procedures, and protocols.		
1.3	Define the classification of analytical techniques and selecting an analytical method		
1.4	Familiar with uncertainties; calibrations; detection limits; interferences; quality control and assurance and validation of analytical methods		
1.5	Know the classification of sampling and physical state, sampling of liquids, gas and solids		
1.6	Recognize the deference between accuracy and precision: determinate errors, indeterminate errors, significant figures, standard deviation		
1.7	Outline the propagation of errors, the confidence limit, tests of significance, rejection of a result, linear least squares, correlation coefficient and coefficient of determination, detection limits and quality control		
2.0	Cognitive Skills		

2.1	Design the schematic diagram of the analytical approach to problem solving, showing the role of the quality assurance program	<ul style="list-style-type: none"> • Lectures • Scientific discussion • Library visits • Web-based study • Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course. • Enhancing open discussion during the lecture. 	<ul style="list-style-type: none"> • Exams • web-based student performance systems • portfolios • long and short essays • Through assignments and homework.
2.2	Apply the suitable methods to analysis the data		
2.3	Formulate the different types of errors		
2.4	Confirm the accuracy and precision: determinate errors, indeterminate errors, significant figures, standard deviation		
2.5	Apply the quality control and quality assurance		
3.0	Interpersonal Skills & Responsibility		
3.1	Take the personality and responsibility for their own learning.	<ul style="list-style-type: none"> • Encourage the solving problems in groups during lecture. • Making open discussion about certain recent topic of the course. 	Homework and group reports
3.2	Work effectively in groups and exercise leadership when appropriate.		
3.3	Act ethically and consistently with high molar standards in personal and public forums.		
3.4	Community linked thinking		
4.0	Communication, Information Technology, Numerical		
4.1	Communicate effectively in oral and written forms.	<ul style="list-style-type: none"> • Lectures • Scientific discussion • Library visits • Web-based study 	<ul style="list-style-type: none"> • Exams • web-based student performance systems • portfolios • long and short essays
4.2	Use information and communication technologies		
4.3	Use basic mathematical and statistical techniques.		

5.0	Psychomotor(if any)		
5.1	Not Applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Activities and Assignments.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	Total		100%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

- We have faculty members to provide counselling and advice.
- Office hours: During the working hours weekly.
- Academic Advising for students.

E Learning Resources

1. List Required Textbooks

- R. Gopalan "*Analytical Methods: Interpretation, Identification, Quantification*", 1st ed., Orient BlackSwan, 2018.

2. List Essential References Materials (Journals, Reports, etc.)

- Lecture Handouts available on the coordinator website.

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

- <http://www.chemweb.com>
- <http://www.sciencedirect.com>
- <http://www.rsc.org>

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

- Equipped classrooms.
- Providing hall of teaching aids including computers and projector.

2. Technology resources (AV, data show, Smart Board, software, etc.)

- Room equipped with computer and projector and TV.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or

attach list)

- **No other requirements**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

- Complete the questionnaire evaluation of the course in particular

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department

- Observations and the assistance of colleagues.
- Independent evaluation for extent to achieve students the standards.
- Independent advice of the duties and tasks.

3. Procedures for Teaching Development

- Workshops for teaching methods.
- Continuous training of member staff.
- Review of strategies proposed.
- Providing new tools for learning.
- The application of e-learning.
- Exchange of experiences internal and external.

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)

- Check marking of a sample of exam papers, or student work.
- Exchange corrected sample of assignments or exam basis with another staff member for the same course in other faculty.

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

- Periodic Review of the contents of the syllabus and modify the negatives.
- Consult other staff of the course.
- Hosting a visiting staff to evaluate of the course.
- Workshops for teachers of the course.

Name of Course Instructor: Prof. Amr Lotfy Saber

Signature:  Date Completed: 24/10/2018

Program Coordinator: **Dr. Ismail Ibrahim Althagafi**

Signature:  Date Received: **25/10/2018**



Kingdom of Saudi Arabia
Ministry of Education
Umm Al-Qura University
Deanship of Graduate Studies



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