Kingdom of Saudi Arabia

The National Commission for

Academic Accreditation & Assessment

COURSE SPECIFICATION

(Analytical Chemistry 1, 402221-3)

1435/ 1436 H

Course Specification

Institution: **Umm Al-Qura University**
College/Department**: Applied Science /Chemistry Department**

A Course Identification and General Information

1. Course title and code: **Analytical Chemistry 1/ 402221-3**
2. Credit hours/ **3 hrs**
3. Program(s) in which the course is offered: **Industrial Chemistry**
4. Name of faculty member responsible for the course: **Dr. Mohamed A. Kassem**
5. Level/year at which this course is offered: **level 4 / second year**
6. Pre-requisites for this course : **Principles of analytical chemistry**
7. Co-requisites for this course: **Nothing**
8. Location if not on main campus: **Chemistry Department**

B. Objectives

1. Summary of the main learning outcomes for students enrolled in the course. By finishing of this course, the students will be able to discuss and understand: - The theory and the practice of titrimetric and gravimetric aspects - How to prepare the samples for analytical procedures - The difference between amorphous and crystalline precipitates.
2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field) - Continuous updating learning sources for the course, so that students benefit from more than one reference. - Encourage students to prepare reports include the solving some related problems in analytical chemistry. - The use of teaching intelligent classes for lectures.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered		
List of Topics	**No of Weeks**	**Contact hours**
▪ Steps prior to analysis, formulating the question, selecting analytical procedure, sampling, volumetric glassware calibration.	**2**	**4**
▪ Precision and accuracy, types of errors, sample standard deviation, range (spread), absolute and relative errors.	**1**	**2**
▪ Conditions of analytically successful chemical reactions, stoichiometry, standard solutions, primary standards, standard samples and standard methods. ▪ Equivalence and end points, visual indicators, titration curves, direct and indirect titrations and volumetric calculations.	**1**	**2**
▪ Acid-base titrations in aqueous media, strong acid strong base titration curves, strong acid weak base titration curves, weak acid strong base titration curves and salts (conjugate acids and bases) titration curves.	**2**	**4**
▪ Theory of precipitation titrations, titration curves, argentimetric titrations, comparison of Mohr, Volhard and Fajan methods.	**1**	**2**
▪ Theory of complex formation titration, titration curves using conditional formation constants	**1**	**2**
▪ Redox titration curves, redox indicators, auxiliary oxidizing and reducing agents, Application of standard reductants and oxidants, titrations with permanganate in strongly acidic and strongly basic media.	**2**	**4**
▪ Types of gravimetric methods, prior steps and sample treatment in gravimetric analysis, properties of precipitates, precipitating agents and weighing formula. Drying or ignition. Calculations. ▪ Precipitation formation, nucleation, homogeneous and heterogeneous nucleation, precipitate growth as particles or crystals. Complete precipitation (common ion effect, pH, ionic strength, complex formation and solvents).	**2**	**4**

▪ Crystalline and amorphous precipitates, K_{SP} magnitude, supersaturation, relative saturation, conditions for best crystalline precipitates and best amorphous precipitates. ▪ Precipitation from homogeneous solution and factors affecting the precipitate.	**1**	**2**
▪ Contamination of precipitates, co and post or induced precipitation, surface adsorption, formation of mixed crystals, occlusion. Steps for the removal of contaminants, water in precipitates.	**1**	**2**

2 Course components (total contact hours per semester):

Lecture: **28**	Tutorial: …..	Laboratory **42**	Practical/Field work/Internship	Other:……..

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week)

- Students spend two hours during the whole semester to discuss, and resolve questions and duties of the course.

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired

- The difference between accuracy and precision
- Different types of titration processes

- Standard solutions and standard substances
- Knowing the correct way for success precipitation process
- Overcome the all contaminants which affects the precipitate

(ii) Teaching strategies to be used to develop that knowledge

- Scientific discussions during the lectures.
- The use of library to perform work duties and prepare small research reports about titration methods
- Resolve problems and questions concerned with the topics presented during lectures as homework.
- Use of the internet to prepare some reports about Gravimetric analysis and types of contamination

(iii) Methods of assessment of knowledge acquired

- Written periodic and final exams.
- Scientific discussions and effective participations during the lectures.
- Preparing scientific reports and weekly homework.

b. Cognitive Skills

(i) Description of cognitive skills to be developed

- The student learns how to proceed a successful titration process and how to overcome all usual errors
- The student acquires the ability to recognize the properties the properties of standard substances and standard solutions in addition to different reactions which occurs during titration
- The student understands all steps which must be done during gravimetric analysis and how to overcome all contamination types.

(ii) Teaching strategies to be used to develop these cognitive skills

- Provide the students with examples and practical tasks that performed under the supervision of lecturers.
- Assigning student's duties that include open tasks designed for the application of prediction and analysis skills, problem solving.
- Giving some applied examples and problem and ask the students to find a strategic plan to

resolve them.

(iii) Methods of assessment of students cognitive skills

- Periodic exams and oral discussions.
- Measuring the response of students for the assignments.

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Evaluate and develop the student's ability to work in a team.
- The development of the ability of students to think and work in individual manner.

(ii) Teaching strategies to be used to develop these skills and abilities

- Divide the students into team works to evaluate their ability to work in groups.
- Periodic duties that carried out in individual manner to evaluate the ability of students to take responsibility and self-reliance.

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- Evaluation of the individual tasks such as homework's and duties and to determine the student's ability to self-reliance.

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

- The ability to perform the mathematical calculations and data analysis and introduce it in a statistical way
- The skill to deal with computer and internet in order to download the research papers and articles that related to the course.

(ii) Teaching strategies to be used to develop these skills

- The use of computers in the training room of the department.
- Organization of group visits to the central Library.
- The use of the international information network (internet).

(**iii) Methods of assessment of students numerical and communication skills**

• Ask questions that measure the student's ability to interpret simple statistical information. • Evaluate the homework's and duties associated with the proper use of communication skills and numerical process.
e. Psychomotor Skills (if applicable)
(i) Description of the psychomotor skills to be developed and the level of performance required • It is not requirement for this course.
(ii) Teaching strategies to be used to develop these skills • It is not requirement for this course.
(iii) Methods of assessment of students psychomotor skills • It is not requirement for this course.

5. Schedule of Assessment Tasks for Students During the Semester:			
Assessment	**Assessment task (eg. essay, test, group project, examination etc.)**	**Week due**	**Proportion of Final Assessment**
1	Class activities, Attendances and Duties	Throughout the Term	**10%**
2	Mid-Term Exam (s)	5-14	**20%**
3	Lab Activity and Final Exam on Lab	Throughout the Term	**30%**
4	Final Exam	End of the Term	**40%**
5	**Total**		**100%**

D. Student Support

1. Arrangements for availability of teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) • The presence of Staff members during the work hours to provide students with guidance and advice.

• Provide the students with the academic mentoring from the suitable members. • Office hours: during the days of the week work days.

E. Learning Resources

1. Required Text(s) • Fundamentals of Analytical Chemistry, Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, 8th ed., Cengage Learning, 2003.
2. Essential References • Analytical Chemistry: An Introduction (Saunders Golden Sunburst Series), Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, 7th ed., Cengage Learning, 1999. • Analytical Chemistry, D.C. Gary, 5th ed., John Wiley &Sons, New York. 1994. • Basic Concepts of Analytical Chemistry New Age, S.M. Khopkar, International Publisher, 2009.
3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List) • Analytical Chemistry, Gary D. Christian, 6th ed., New York- John Willy, 2004
4. Electronic Materials, Web Sites etc http://www.intechopen.com/subjects/analytical-chemistry
5- Other learning material such as computer-based programs/CD, professional standards/regulations: • CDs contain programs specified to Analytical Chemistry 1.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.): • Equipped lecture halls.
2. Computing resources: • 30 computers, one slide show (Data Show) and TV.
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) : • None.

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • The educational process is evaluated using questionnaire forms or panel discussions with students in order to identify and address weakness and strength points.
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Prepare a course report based on the results of the students to give us an indication about the planned outputs
3. Processes for Improvement of Teaching • Training programs and workshops for staff members to improve the educational process level.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) • We will try to carry it but it does not applied until now
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • A comparison of the course level should be made with similar courses at foreign universities.