

**Kingdom of Saudi Arabia**  
**The National Commission for**  
**Academic Accreditation & Assessment**



**COURSE SPECIFICATION**  
**(Analytical Chemistry 3, 402353-3)**  
**1435/ 1436 H**

# Course Specification

Institution: <b>Umm Al-Qura University</b>
College/Department : <b>Applied Science /Chemistry Department</b>

## A. Course Identification and General Information

1. Course title and code: <b>Analytical Chemistry 3/ 402353-3</b>
2. Credit hours: <b>3 hrs</b>
3. Program(s) in which the course is offered: <b>Pure Chemistry</b>
4. Name of faculty member responsible for the course: <b>Dr. Mohamed A Kassem</b>
5. Level/year at which this course is offered: <b>level 6 / third year</b>
6. Pre-requisites for this course : <b>Analytical Chemistry (2)</b>
7. Co-requisites for this course:
8. Location if not on main campus:

## B. Objectives

<p><b>1. Summary of the main learning outcomes for students enrolled in the course.</b></p> <p>By finishing of this course, the students will be able to discuss and understand:</p> <ul style="list-style-type: none"><li>- The theory and the practice of All separation methods.</li><li>- How to prepare and use column and thin layer chromatography.</li><li>- How to interpretation and use thermal analysis charts.</li></ul>
<p><b>2. Briefly describe any plans for developing and improving the course that are being implemented.</b> (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)</p> <ul style="list-style-type: none"><li>- Continuous updating learning sources for the course, so that students benefit from more than one reference.</li><li>- Encourage students to prepare reports include the solving some related problems in analytical chemistry.</li><li>- The use of teaching intelligent classes for lectures.</li></ul>

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

<b>1. Topics to be Covered</b>		
<b>List of Topics</b>	<b>No of Weeks</b>	<b>Contact hours</b>
▪ Introduction to course and separation science issues.	<b>1</b>	<b>2</b>
▪ theory and applications of solvent extraction, concentration distribution ratio vs. partition coefficient, mass distribution ratio, %E, extraction selectivity, extraction systems, extraction of metal ions.	<b>1</b>	<b>2</b>
▪ Classification of chromatographic methods, nature of partition forces, chromatographic behaviour of solutes, column efficiency and resolution, column processes and theory of band broadening.	<b>2</b>	<b>4</b>
▪ Liquid column chromatography, instrumentation and optimization, solvent delivery system, sample introduction, separation columns, detectors, optimization of column performance, planar chromatography.	<b>2</b>	<b>4</b>
▪ Supercritical fluid chromatographic technique	<b>1</b>	<b>2</b>
▪ Theory of complex formation titration, titration curves using conditional formation constants	<b>2</b>	<b>4</b>
▪ High-performance liquid chromatography, adsorption chromatography, liquid-liquid partition chromatography, ion-exchange HPLC, exclusion chromatography	<b>2</b>	<b>4</b>
▪ Gas chromatography, gas chromatographs, detectors, optimization of experimental conditions, gas-chromatographic columns and the stationary phase, the stationary liquid phase, applications	<b>2</b>	<b>4</b>
▪ Planar Chromatography	<b>1</b>	<b>2</b>

<b>2. Course components (total contact hours per semester):</b>				
Lecture: <b>28</b>	Tutorial: .....	Laboratory <b>42</b>	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 theoretical aspects of separation techniques
- Understanding the mechanism of separation
- Improving the sensitivity and efficiency of separation
- Understanding the idea for all indicators used in separation equipment's

**(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 perform a successful separation procedures
- The student acquires the ability to optimize the conditions for planar and column chromatography
- The student understands all steps for perfect solvent extraction and how to increase selectivity.

### **(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.

<p><b>(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility</b></p> <ul style="list-style-type: none"> <li>• Evaluation of the individual tasks such as homework's and duties and to determine the student's ability to self-reliance.</li> </ul>
<p><b>d. Communication, Information Technology and Numerical Skills</b></p>
<p><b>(i) Description of the skills to be developed in this domain.</b></p> <ul style="list-style-type: none"> <li>• The ability to perform the mathematical calculations and data analysis and introduce it in a statistical way</li> <li>• The skill to deal with computer and internet in order to download the research papers and articles that related to the course.</li> </ul>
<p><b>(ii) Teaching strategies to be used to develop these skills</b></p> <ul style="list-style-type: none"> <li>• The use of computers in the training room of the department.</li> <li>• Organization of group visits to the central Library.</li> <li>• The use of the international information network (internet).</li> </ul>
<p><b>(iii) Methods of assessment of students numerical and communication skills</b></p> <ul style="list-style-type: none"> <li>• Ask questions that measure the student's ability to interpret simple statistical information.</li> <li>• Evaluate the homework's and duties associated with the proper use of communication skills and numerical process.</li> </ul>
<p><b>e. Psychomotor Skills (if applicable)</b></p>
<p><b>(i) Description of the psychomotor skills to be developed and the level of performance required</b></p> <ul style="list-style-type: none"> <li>• It is not requirement for this course.</li> </ul>
<p><b>(ii) Teaching strategies to be used to develop these skills</b></p> <ul style="list-style-type: none"> <li>• It is not requirement for this course.</li> </ul>
<p><b>(iii) Methods of assessment of students psychomotor skills</b></p> <ul style="list-style-type: none"> <li>• It is not requirement for this course.</li> </ul>

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

#### **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)**

1. Instrumental Methods of Analysis, H. H. Willard, L. L. Merritt, J. A. Dean and F. A. Settle, Wadsworth Publishing Company, 1988.

##### **2. Essential References**

1. Instrumental Methods of Chemical Analysis, G. W. Ewing, 5<sup>th</sup> ed., Mc Graw-Hill Int., 1985.

##### **3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)**

Quantitative Chemical Analysis, Daniel C. Harris, 8<sup>th</sup> ed., W.H. Freeman and Company, 2011.

##### **4- Electronic Materials, Web Sites etc**

<http://www.chromatographytechniques.com/>

**5- Other learning material such as computer-based programs/CD, professional standards/regulations**

- CDs contain programs specified to Analytical Chemistry 3.

**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.