

# National Commission for Academic Accreditation & Assessment

## Course Specification

Institution	King Khalid University
College/Department	Science/Chemistry

### A Course Identification and General Information

1. Course title and code:	Quantitative Analysis-1 (Chem 242)
2. Credit hours	3
3. Program(s) in which the course is offered.	Chemistry
4. Name of faculty member responsible for the course	Dr. Hisham Salah Abd-Rabboh
5. Level/year at which this course is offered	4 <sup>th</sup> /2 <sup>nd</sup>
6. Pre-requisites for this course (if any)	Qualitative Analysis (Chem. 241)
7. Co-requisites for this course (if any)	None
8. Location if not on main campus	

## B Objectives

<p>1. Summary of the main learning outcomes for students enrolled in the course.</p> <p>The aim of the course is to enable students to understand the quantitative methods of chemical analysis. The course emphasizes on basic concepts of volumetric and gravimetric methods of analysis. It includes recognizing the type of reactions, understanding chemical calculations, and designing titration curves used in quantitative analysis methods.</p>
<p>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)</p> <ul style="list-style-type: none"><li>- Encourage students to practise self-learning via the library and web links</li><li>- Dividing the students into groups to develop their ability in working within the team</li></ul>

## 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
Introduction to chemical analysis; types and principals	1.5	4.5
Volumetric analysis and methods for expressing concentration	1	3
Equivalent weight, definition and calculations	1	4.5
Acid-Base titrations, principals, acid-base indicators, pH calculations, types of buffer solutions and acid-base titration curves	2	6
Reduction-Oxidation (Redox) titrations: balancing of redox equations, principals and types of indicator (self, specific and true).	1.5	4.5
Precipitation titrations, principals, solubility products, methods for the detection of end points (Mohr's, Volhard's and Fajan's methods)	1	3
Complex formation titrations, definitions, EDTA as the best titrating agent, titration curves, metallochromic indicators.	1.5	4.5
Gravimetric analysis: Principals and steps for successfully performance	1.5	4.5
Factors affecting the formation of precipitate, types of impurities and methods for improving the properties of the precipitate	1.5	4.5

Chemical factor and Gravimetric calculations	1.5	4.5
Number of weeks and total contact hours	۱۴	۴۲

2 Course components (total contact hours per semester):				
Lecture:	Tutorial:	Laboratory	Practical/Field work/Internship	Other:
42	none	Separate course 261 Chem.	None	Office hours and discussion board

<p>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)</p> <p>Student needs 6 hrs/week to study and solve the assignments and making some reports</p>
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<p>4. Development of Learning Outcomes in Domains of Learning</p> <p>For each of the domains of learning shown below indicate:</p> <ul style="list-style-type: none"> <li>• A brief summary of the knowledge or skill the course is intended to develop;</li> <li>• A description of the teaching strategies to be used in the course to develop that knowledge or skill</li> <li>• The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned</li> </ul>
<p><b>a. Knowledge</b></p> <p>(i) Description of the knowledge to be acquired</p> <ul style="list-style-type: none"> <li>- Recognizing the methods of chemical analysis and focusing in volumetric and gravimetric analysis methods since they are the simplest, convenient and cost-competitive methods.</li> <li>- Studying different reaction types used in titration methods.</li> <li>- Let the student practising the drawing of titration curves and extract some useful information from them.</li> <li>- Knowing how to determine the unknown concentration of a substance using another standard one.</li> </ul>

<p>(ii) Teaching strategies to be used to develop that knowledge</p> <p>Teaching strategies involve:</p> <p><b>A- Lectures</b></p> <ul style="list-style-type: none"> <li>- Preliminary lectures to teach the students to know the course content and the course objectives and prepare the students to the forthcoming students.</li> <li>- Correlate the principles and the information which student have acquired with course content and objectives.</li> <li>- Organizing some discussions in the lecture time and through the blackboard e-learning system “discussion board”.</li> </ul> <p><b>B- Individual assignments</b></p> <ul style="list-style-type: none"> <li>- Solving the problems which were submitted in the blackboard system which enables the students acquiring the analysing skills.</li> <li>- Encourage students to use the library text books and database.</li> </ul>
<p>(iii) Methods of assessment of knowledge acquired</p> <ul style="list-style-type: none"> <li>- Oral and interaction during the lecture.</li> <li>- Homework.</li> <li>- Meetings with students during the office hours.</li> <li>- Contact with students through e-learning facilities.</li> <li>- Through-term exams (40%), partnership and interaction activities (10%) and final exams (50%).</li> </ul>
<p><b>b. Cognitive Skills</b></p>
<p>(i) Description of cognitive skills to be developed</p> <p>The cognitive skills to be developed involving the abilities to:</p> <ul style="list-style-type: none"> <li>- Finish the individual assignments in the due time.</li> <li>- <b>Analyze</b> the results and <b>make</b> the proved <b>conclusions</b></li> <li>- <b>Correlate</b> between the principals and applications judging from the results.</li> <li>- Recognize the weakness and strengths of volumetric analysis methods</li> </ul>
<p>(ii) Teaching strategies to be used to develop these cognitive skills</p> <ul style="list-style-type: none"> <li>- Offering the course contents</li> <li>- Giving some clarifications and examples in the lectures</li> <li>- Offering the application fields in which volumetric analysis is useful.</li> <li>- Group-type discussion and solving of some application problems.</li> <li>- Open- discussion involving all chemical analysis methods within simple comparison way.</li> <li>- Withdraw student’s attention to some enrichment knowledge resources.</li> </ul>
<p>(iii) Methods of assessment of students cognitive skills</p> <ul style="list-style-type: none"> <li>- Individual and group assignments concerning the principles and applications of chemical analysis methods.</li> <li>- Oral interaction activities in the lecture time.</li> <li>- Some quizzes focusing on the abilities of students to make successful analysing and conclusions.</li> </ul>
<p><b>c. Interpersonal Skills and Responsibility</b></p>

<p>(i) Description of the interpersonal skills and capacity to carry responsibility to be developed</p> <ul style="list-style-type: none"> <li>- Enrol all students in scientific discussions and teach them how to respect other's opinion</li> <li>- Encourage students to express their thinking and overcome their <b>retirement, fair</b> or shame.</li> <li>- Impetus the students to ask any questions related to the course content</li> <li>- Encourage students to collaborate with each other</li> <li>- Providing the students with the skill of logical scientific thinking and the ability to debate constructive scientific objectivity.</li> <li>- Giving the student commitment to <b>doing the asking him of homework</b> and completed on schedule.</li> <li>- Urged students to actively participate in the discussion board on course e-learning link.</li> </ul>
<p>(ii) Teaching strategies to be used to develop these skills and abilities</p> <ul style="list-style-type: none"> <li>- Management lectures to show the importance of the time factor.</li> <li>- Group assignment to support 30% of the duty on the individual contribution to the task of the group, and each group interview during office hours to discuss and advise on the method used for the task.</li> <li>- Individual assignments require the use of the library or the web as a means to develop self-learning skills.</li> <li>- Discuss students in ethical aspects that should be followed in dealing with each other, and respect for each other's opinion, and assess the conditions of the other.</li> <li>- Urged students to abide by ideal ways to obtain scientific information and give it in an accurate way.</li> <li>- Create a spirit of positive and honest competition in the classroom.</li> </ul>
<p>(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility</p> <ul style="list-style-type: none"> <li>- Assessment of the potential for self-learning in individual assignments.</li> <li>- Measuring student posts in the classroom and the ability to debate and analysis, and extent of understanding analysis skills.</li> <li>- The student's commitment to the lecture time expresses its commitment <b>to ethical</b></li> <li>- Keen student to attend the lecture expressed his keenness to receive knowledge and benefit from it.</li> <li>- Student keen to take advantage of office hours reflects his keenness to learn.</li> <li>- Student's cooperation with colleagues confirms that he has a positive social personality.</li> <li>- Student scores in quarterly and final <b>tests</b> reflect his extent of acquisition of knowledge and skills.</li> </ul>
<p><b>d. Communication, Information Technology and Numerical Skills</b></p>
<p>(i) Description of the skills to be developed in this domain.</p> <ul style="list-style-type: none"> <li>- The development of the student's ability to understand and treat with communication skills and the developed information technologies.</li> <li>- Giving the student advanced mathematical skills via recognizing the large interest for the use of advanced technologies because of their advantages to traditional methods such as accuracy and simplicity.</li> <li>- Use of computer programs to accomplish certain tasks such as <b>graphic representation and data analysis.</b></li> </ul>
<p>(ii) Teaching strategies to be used to develop these skills</p> <ul style="list-style-type: none"> <li>- Management of the discussion through the internet using e-learning links.</li> <li>- Communicate electronically with colleagues.</li> <li>- Encourage the student to solve some issues using computer.</li> </ul>
<p>(iii) Methods of assessment of students numerical and communication skills</p> <ul style="list-style-type: none"> <li>- Active participation in the discussions.</li> <li>- Observation and electronic tracking.</li> <li>- Offering evaluation results electronically and opening the door wide to students inquiries.</li> </ul>

<b>e. Psychomotor Skills (if applicable)</b>
(i) Description of the psychomotor skills to be developed and the level of performance required - Not applicable
(ii) Teaching strategies to be used to develop these skills - Not applicable
(iii) Methods of assessment of students psychomotor skills - Not applicable

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	Homework using e-learning, individual and team articles and posts during the lecture and meeting of student with the course instructor in office hours	Continued	10%
2	First quarterly test	6 <sup>th</sup>	20 %
3	Second quarterly test	11 <sup>th</sup>	20 %
4	Final exam	14 <sup>th</sup>	50 %
			100 %

## D.Student Support

<p>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)</p> <ul style="list-style-type: none"> <li>- Providing academic counselling to students in need of it.</li> <li>- Ten hours a week is open to all students.</li> <li>- Additional scheduling with students who need it outside office hours (Gifted and weak students).</li> </ul>
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## E Learning Resources

<p>1. Required Text(s)</p> <ul style="list-style-type: none"> <li>- Fundamentals of Analytical Chemistry, D.A.Skoog, D.M.West, F.J.Holler and S.R.Crouch, 8th ed., 2004, Brooks/Cole.</li> </ul>
<p>2. Essential References</p> <ul style="list-style-type: none"> <li>- Analytical Chemistry by D. Kealey &amp; P.J. Haines, by BIOS Scientific Publications Ltd. 2002.</li> <li>- <b>Chemical Analysis, Modern Instrumental Methods and Techniques. By Francis Rouessac &amp; Annick Rouessac. John Wiley &amp; Sons, LTD. 1998</b></li> </ul>

3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List) - Analytical Chemistry 4 <sup>th</sup> Ed. Solution manual by Gray Christian, 1994, John Wiley & Sons. In
4- Electronic Materials, Web Sites etc - <a href="http://www.chem.vt.edu/chem-ed/a.html">http://www.chem.vt.edu/chem-ed/a.html</a> - <a href="http://elearning.kku.edu.sa">http://elearning.kku.edu.sa</a>
5- Other learning material such as computer-based programs/CD, professional standards/regulations
<b>CDs can be provided with the recommended references Declaration</b>

## 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.)  - The lecture hall. - Equipped laboratories. - Smart board. - Monitors
2. Computing resources - The computer lab room for at least twenty students. - Provide Factory Library CD-ROM.
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)  - Training programs and workshops, and field visits to factories.

## G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching  - Student questionnaires. - Self-evaluation cards. - Colleagues-evaluation cards.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department  - Student Assessment. - Self-assessment based on the exchange of experiences with professors' decision. - Academic department Assessment.
3 Processes for Improvement of Teaching  - Workshops for teaching methods and exchange of experiences - Skills development cycles. - Training courses - Material and moral incentives

4. Processes for Verifying Standards of Student Achievement (e.g. 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)

- The exchange of a sample of tests and assignments with a faculty member teaching the same course in other educational institution.
- Periodic written tests.
- Continuous evaluation.
- Additional duties.

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

- Conduct quarterly meetings to discuss ways of development.
- Periodic meetings with outstanding students to know the strengths and weaknesses of this course.
- The Committee examines the outputs of public teaching decisions and makes the necessary plans for improvement.