Kingdom of Saudi Arabia

The National Commission for

Academic Accreditation & Assessment

COURSE SPECIFICATION

(Principles of Analytical Chemistry, 402105-2)

1435 / 1436 H

Course Specification

Institution: **Umm Al-Qura University**
College/Department: **Faculty of Applied Sciences / Chemistry Department**

A. Course Identification and General Information

1. Course title and code: **Principle of analytical chemistry, 402105-2**
2. Credit hours: **2 theoretical hrs.**
3. Program(s) in which the course is offered (If general elective available in many programs indicate this rather than list programs): **Pure and Industrial Chemistry**
4. Name of faculty member responsible for the course: **Dr. Dr. Amr L. Saber**
5. Level/year at which this course is offered: **3rd level / second year**
6. Pre-requisites for this course (if any): ----------
7. Co-requisites for this course (if any): ---------
8. Location if not on main campus: ----------

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 different analytical methods.

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)

- Using of teaching intelligent classes for lectures.
- Variegation of learning sources for the course, so that students benefit from more than one reference.
- Helping and encouraging students to prepare reports include the bonding theories, the prosperities and uses of selected main group and transition metal elements and types of acids and bases.

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:		
Topic	**No of Weeks**	**Contact hours**
Qualitative and quantitative analysis, the popular front of chemistry. Types of chemical reactions, selectivity, specificity, and sensitivity.	**1**	**2**
Solubility, "like dissolves like", solubility rules, types of solution. Concentration expressions, percent concentration, ppt, ppm, molarity, activity, strength and normality.	**1**	**2**
General review of equilibrium concept and ionic equilibrium. Common ion effect.	**1**	**2**
The chemical composition of aqueous solutions, electrolytes and non electrolytes, acids and bases, conjugate acids and bases, amphiprotic solvents, autoprotolysis Kw, p-function.	**1**	**2**
Monoprotic acids and bases, calculating pH of aqueous strong acids and strong bases.	**1**	**2**
Calculating pH of weak aqueous acids and bases at (Ca≥100Ka, Cb≥100Kb) and (Ca<100Ka, Cb<100Kb).	**1**	**2**
Calculating pH of aqueous polyfunctional acids and bases. The effect of pH on their aqueous composition (α).	**1**	**2**
Calculating the pH of aqueous solutions of salts (conjugate acids and bases) (examples, CH3COO-Na+, NH4+Cl-, NaHCO3).	**1**	**2**
Buffer solutions, composition and mechanism of action, buffer capacity and Henderson-Hasselbalch equation. Acid – base indicators.	**1**	**2**
Precipitation reactions, heterogeneous equilibrium, solubility product.	**1**	**2**
The application of solubility product and pH concepts in the separation of copper (II) group (II) and zinc group (IIIB) metal ions as sulphides, similarly magnesium and iron (III) are separated as hydroxides.	**1**	**2**

The nuisance of colloids, description, properties and how it can be useful qualitatively and quantitatively.	**1**	**2**
Complex formation reactions, formation constants, competing equilibria (the effect of complexing agents on the formation of precipitates). Applications in qualitative analysis(Masking, demasking and colour formation).	**1**	**2**
Redox reactions, electrochemical cells, electrode potential (E° and E°´), Nernst equation. Redox equilibrium constants.	**1**	**2**

2. Course components (total contact hours per semester):			
Lecture: **28**	Tutorial: _____	Practical/Fieldwork /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 be developed.
- 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 knowledge of students to principles of analytical chemistry
- Choose the suitable conditions for analysis and removing the impurities

- Discover the suitable method for volumetric and gravimetric analysis and its procedures
- Knowledge and understanding the theoretical principles of qualitative analysis
- Write the importance of analytical chemistry applications

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

- 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

(iii) Methods of assessment of knowledge acquired:

- Writing final exams and mid term exams
- Oral exams
- Automatic discussions
- The subject research in titles of the course

b. Cognitive Skills

(i) Cognitive skills to be developed:

- Development the reverse think skills and student gains the practical skills to choose the suitable methods to volumetric and gravimetric analysis and its pollution
- Student gains the skills for Statistical calculations for analytical methods
- Student can selective the suitable method to purify the precipitate
- Design the standard methods of gravimetric analysis to remove the impurities
- Student can create the different ideas to study the precipitation process
- Student can plan to Formation of precipitates and crystal growths
- Student study factors affecting the precipitate

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

- 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.
- Applications, examples and asking students to prepare strategy plan for solving
- Learning transfer using analytical tools in different applications
- Homework which include detection and problem solving

(iii) Methods of assessment of student cognitive skills:

- Through assignments, exams and homework.

c. Interpersonal Skills and Responsibility

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

- Take the personality and responsibility for their own learning
- Working effectively in groups and exercise leadership when appropriate
- Act ethically and consistently with high molar standards in personal and public forms
- Community linked thinking

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

- Encourage the solving problems in groups during lecture.
- Making open discussion about certain recent topic of the course

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

- Homework and group reports

d. Communication, Information Technology and Numerical Skills:

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

- Communicate effectively in oral and written forms

- Use information and communication technologies
- Use basic mathematical and statistical techniques

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

- Using Computer labs
- Visiting the centre library
- Visiting the research centers
- Using the international information net

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

- Exams contain special equations to describe the statistical information
- Assessment the homework which related to communication skills
- Special part to assessment ICT level

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 here.

(iii) Methods of assessment of students psychomotor skills: It is not requirement here

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	**Periodic exam-1**	**After 5 weeks**	**20%**
3	**Periodic exam-2**	**After 10 weeks**	**20%**
4	**Final examination**	**End of the term**	**50%**
5	**Total**		**100**%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week):

• Office hours: during the days of the week work days.

• 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.

E. Learning Resources

1. Required Text(s):

- 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.
- D.C. Gary, Analytical Chemistry, 5th ed., John Wiley &Sons, New York. 1994.

2. Essential References

- Basic Concepts of Analytical Chemistry New Age, S.M. Khopkar, International Publisher, 2009.
- Analytical Chemistry, Gary D. Christian, 6th ed., New York- John Willy, 2004.

3. Recommended Books and Reference Material (Journals, Reports, etc)

- Fundamentals of Analytical Chemistry, Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, 8th ed., Cengage Learning, 2003.

4. Electronic Materials, Web Sites etc:

• http://www.chem1.com.

• www.webelements.com.

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

• None.

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 faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in 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.