

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



COURSE SPECIFICATION
(Physical Chemistry 2, 402354-3)

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: Physical Chemistry 2, 402354-3
2. Credit hours: Three (2 theoretical + 1 practical) hrs.
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Pure Chemistry
4. Name of faculty member responsible for the course: Prof. Mohamed Ismail Mohamed Awad
5. Level / year at which this course is offered: 5th level / 3
6. Pre-requisites for this course (if any): Physical Chemistry (1), 402241-2
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. This course aim to : <ul style="list-style-type: none">- Understand and know the basics of chemical kinetics.- Understand the theories and principles of rate of reactions.- Have a scientific background of the theoretical basis of the activation energy.- Acquire of scientific ideas, theories and approaches of collision reaction.- Acquire of scientific ideas, theories and approaches to catalysis, types of catalysis.- Understand the theories and principles of the mechanism of catalytic reactions.

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)

- The use of information technology or the Internet in order to increase awareness of the concepts of Chemical Kinetics
- Using the Smart Board in teaching to facilitate the conclusion of laws and applications used in the course.
- Regular update to the course material according to the recent references.

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

Topics to be Covered		
List of Topics	No of Weeks	Contact hours
Fundamentals of chemical kinetics: reaction rates, rate laws, reaction order.	1	2
Factors affecting the reaction rate.	1	2
Integration of simple rate equations of: zero, first, second, third and n -order reactions.	2	4
Dependence of rate on temperature.	1	2
Test 1	1	2
Conventional methods of following a reaction.	1	2
Methods of determining the reaction order from experimental data. Heterogeneous catalysis: gas-solid catalysis, enzymatic catalysis	2	4
Theories of chemical reactions: collision theory, transition state theory.	1	2
Kinetics of complex reactions. Kinetics in solutions.	1	2
Test 2	1	2
Basic principles of catalysis: introduction, definitions, classification of catalysis.	1	2
Homogeneous catalysis: mechanism, kinetics, acid-base catalysis.	1	2

Laboratory Experiments Outline

Topics to be Covered		
List of Experiments	No of Weeks	Contact hours
Catalytic decomposition of hydrogen peroxide as a first order reaction.	2	6
Hydrolysis of ester as pseudo-first order reaction.	2	6
Saponification of ester as a second order reaction.	2	6
Persulfate-iodide reaction.	2	6
Oxidation of hydrogen peroxide to determine the order and the thermodynamic parameters.	2	6
Halogenation of acetone in solution as a zero order reaction.	1	3
Autocatalytic reaction between potassium permanganate and oxalic acid.	1	3
Review	1	3
Final Exam	1	3

2. Course components (total contact hours per semester):				
Lecture:	Tutorial:	Laboratory	Practical/Field work	Other:
28 hours	Theoretical	42 hours	/Internship	

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)
- 26 hours (2 hrs per week)

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.

On completing this course students will be able to :-

- Acquire the scientific background to identify the rate of reaction.
- Know and understand the applications of kinetic chemistry.
- Gain the scientific information about the first , second and third order of reactions.
- Identify the the effect of temperature on reaction rate and the appointment of the activation energy.
- Acquire the scientific background to identify knowledge of the characteristics of a catalyst.
- Identify the criteria in terms of adsorption

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

- Subject knowledge , and understanding are acquired through a range of lectures, laboratory classes, and exercises.
- Acquisition of knowledge is achieved mainly through lectures, problem classes, laboratory sessions, coursework, essays and projects.

(iii) Methods of assessment of knowledge acquired

- Class discussion and oral exams
- Coursework reports
- Laboratory exam and reports
- Final written exam at the end of semester

b. Cognitive Skills

(i) Description of cognitive skills to be developed

By the compilation of this course, students will be able to :-

- Analysis of experimental results to improve order of reactions
- Using the scientific concepts and data to recognize and compare between first , second and third order of reactions.
- Select and apply the appropriate technique of work at the laboratory.
- Integrate and evaluate relevant techniques and theories of kinetic chemistry.
- Select the appropriate technique for mechanical catalysis and the theories that explain it.

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

- Application of essential scientific techniques through lectures, practical lessons, essays.
- Analysis and summarizing information of scientific experimental results in small group discussion

and class work.

- Applying appropriate mathematical scientific methods and principals in kinetic chemistry.

(iii) Methods of assessment of students cognitive skills

- Examination.
- Assessed laboratories.
- Evaluation of the research papers.
- Final written exam at the end of the semester.

c. Interpersonal Skills and Responsibility

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

- Act in responsible ethical manner.
- Ability of self-learning using learning recourses and websites.
- Develop the necessary skills of writing and English conversation as a good for the connection of sciences.
- Improve and develop analytical capabilities for solving the problems and ideas.
- The ability to work effectively individually and in team.
- Act responsibly in personal and professional relationships.

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

- Assignment and homework exercises.
- The development of substantive discussions in the classroom
- Improve student performance to conduct research on the World Wide Web (Internet).
- Improve student performance in practice their duties and responsibilities to topics.
- Laboratory work , special assignments and search for data and information on their own.

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

- Evaluation of homework for students
- The performance of duties by groups and then corrected for each other.
- Evaluation of the interaction of students in the classroom.
- Give the exercises in the classroom.
- Observation of student ethical and moral behaviour.

d. Communication, Information Technology and Numerical Skills

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

By the compilation of this course, students will be able to :-

- Solve exercises and questions related to increase their numerical and statistical skills.
- Work in a group to discuss issues of domestic duties and their meanings and objectives.
- Make good and clear discussion and clear on the concepts of kinetic chemistry.
- Communicate link between the science of kinetic chemistry and other sciences related.
- Develop the skills to deal with the problems of numerical calculations and laws.
- Research on the Internet for various topics related to the course.

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

- Encourage collective discussion among the students in the classroom.
- Duties focused on the development of numerical capacity of the students in dealing with issues of kinetic chemistry.
- Short presentations for various topics related to the curriculum research paper depend on the use of internet.

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

- Seminar evaluation.
- Evaluation of student essay and assignments.
- Marks given to for good reports and presentations.

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

- Undertake laboratory investigations in responsible and follow safety regulations.
- Collect , record , and analyse data using appropriate techniques in the laboratory.
- Demonstrate the necessary skills to work safety and competently in practical situations.
- The ability to analyse and critically evaluate experimental data.

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

- Applied throughout the reporting of laboratory exercises.
- Laboratory classes involving all aspect of practical and professional skills.
- Engage student in analysis and evaluation of their practical work.

(iii) Methods of assessment of students psychomotor skills

- Assessed laboratories.

- Coursework reports.
- Laboratory exams and reports.
- Practical final exam and oral test.

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)

- Two hours office per week
- Lab assistance

E. Learning Resources

1. Required Text(s):

An Introduction to Chemical Kinetics, Margaret Robson Wright, New York, N Y: John Wiley & Sons, 2004.

2. Essential References

- 1- Physical Chemistry, P. Atkins and J. de Paula, 8th ed. W. H. Freeman and Company, New York, NY, USA, 2006.
- 2- Catalytic chemistry, Bruce C. Gates, New York, N Y: John Wiley & Sons, 1992.

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

1- Physical Chemistry, Amazon logo Silbey, R. R. Alberty, and M. Bawendi, 4th ed., New York, N Y: John Wiley & Sons, 2004.
4-.Electronic Materials, Web Sites etc - http://www.chem.com - http://chemyana.com
5- Other learning material such as computer-based programs/CD, professional standards/regulations - NA

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.) - Lecture hall equipped with modern teaching technology for 50 students - Laboratory equipped in accordance with the rules of safety and security - Smart Board.
2. Computing resources NA
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) NA

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching - Students evaluation Questionnaire in each semester - Meeting and discussion to take the students opinions about the course - E-suggestion
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Self evaluation. - Revision of the course contents by responsible faculty member. - Revision by the committee of the department.

3. Processes for Improvement of Teaching

- The use of modern technological methods in teaching.
- Establish training courses for the development of scientific concepts.
- Ensure the establishment of training courses to acquire the skill of speaking English.
- The provision of laboratories with high possibilities and safety tools.

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)

- Correction of a random sample of assignments and examinations by other staff member.
- Comparison of results of examinations with the results of other universities.
- Hold regular meetings with professors from other universities to share experiences on the performance of students.

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

- Collection of the evaluation reports and studying it.
- Designation a plan of improvement.
- Updating of the course materials regularly according to the previous reports.
- Conducting a meeting with the departmental committee for discussing the evaluation reports and share knowledge.