

National Commission for Academic Accreditation & Assessment

Course Specification

Institution	KING KHALID UNIVERSITY
College/Department	College of Science – Department of Chemistry

A Course Identification and General Information

1. Course title and code:	Inorganic Reaction Mechanisms (Chem 426)
2. Credit hours:	(Theory+Practical): 2 + 0
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs)	Bachelor Degree in Chemistry (BSc)
4. Name of faculty member responsible for the course	Dr. Ahmed Ramadan
5. Level/year at which this course is offered	Level 8 / 4th Year
6. Pre-requisites for this course (if any)	General Chemistry (1) – Chem 101
7. Co-requisites for this course (if any)	Chemistry of Transition Elements - Chem 323
8. Location if not on main campus	

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

This course aims to introduce students to basic knowledge and principle in inorganic reaction methods, rate constant and mechanism for Fast and Slow Reaction. Also, it focuses on the formation of inorganic aqueous ionic complexes, step wise complex formation, factors affecting the stability of complexes, ligand substitution reactions, theories of inorganic reaction mechanisms and formal kinetics and rate laws. Kinetics and Mechanism for oxidation-reduction reaction in inorganic complexes , inner sphere and outer sphere reactions. Ligand reactions and reaction mechanisms of organometallic and bioinorganic systems.

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)

- Problem solving skills, relating to qualitative and quantitative information
- E-Learning System is being introduced.
- Students can download course material which can be helpful for the students learning.
- For the research, use internet such as Wikipedia, Googleetc.
- Interpersonal skills, relating to the ability to interact with other people and to engage in team-working through group discussion.

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: tools and concepts of inorganic reaction mechanisms	1	2
• Aqueous ionic complexes, step wise complex formation, factors affecting the stability of complexes, soft and hard acids and bases.	2	4
• Rate laws for different reaction mechanisms.	3	6
• Substitution reactions in octahedral complexes - dissociation and association mechanisms - aquation reactions.	2	4
• Substitution reactions in square planar complexes, trans effect and the theories for it's explanation	2	4

<ul style="list-style-type: none"> Mechanism for oxidation-reduction reaction, inner sphere and outer sphere reactions. 	2	4
<ul style="list-style-type: none"> Ligand reactions and reaction mechanisms of organometallic and bioinorganic systems 	1	2

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

<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> <ul style="list-style-type: none"> - Assignments 4 Hrs - Tutorials 4 Hrs - Blackboard 8 Hrs Total 16 Hrs

<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"> 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.
<p>a. Knowledge</p>
<p>(i) Description of the knowledge to be acquired</p> <ul style="list-style-type: none"> - Students should learned that, many terms and concepts are the same as in organic mechanisms with some significant principles such as complex geometries are more common in inorganic complexes, more rearrangements are possible, more isomers are possible, not all metal ions react alike; while all carbon atoms do. - Also, they should know some history and aims about Inorganic Reaction Mechanisms such as, Werner and Jorgenson discovered many of the basic reactions, experimentation over many years has yielded proposed mechanisms, mechanisms can't be proven only disproven, even after 4D microscopic techniques developed by Nobel Laureate, Professor Ahmed Zweil, We can't directly observe individual molecules react, Evidence either supports a mechanism or rules it out. - Understand the process of chemical bonding and predict what type of bonds will form between different substances.

<ul style="list-style-type: none"> - Able to deal with the scientific data in English and solving problems related to qualitative and quantitative information.
<p>(ii) Teaching strategies to be used to develop that knowledge</p> <ul style="list-style-type: none"> - Class room lectures - Power point representations - Meeting individual students during office hours to solve their problems related to language learning, and encourages them to enjoy learning the new language. - Introductory lecture gives an overview of the content and significance of the course and of its relationship to students' existing knowledge. Each subsequent lecture begins with a similar overview linking the particular content of the presentation to the general overview. - Assignments - Individual handwritten assignments require use of library reference material and web sites to identify information required to complete tasks. - E-learning through university website
<p>(iii) Methods of assessment of knowledge acquired</p> <p>Questions may be in the form of: multiple choice, matching, fill in the blank, short answers, and problems</p> <ul style="list-style-type: none"> - First Midterm Exam : 20 % - Second Midterm Exam: 20 % - Assignments and oral exam: 10 % - Final examination: 50%
<p>b. Cognitive Skills</p>
<p>(i) Description of cognitive skills to be developed</p> <ul style="list-style-type: none"> - English Language skills, - Symbolic thinking skills, - Reasoning, Perception, and Intuition, - Attention, Memory, Self-regulation, and Motor executive functions - Interpreting, Analysing, Summarizing, and Evaluating the reading materials, - Comparing and contrasting - Storing, manipulating, and retrieving information - The ability to use the Internet for more information specially you tube. - Demonstrate good understanding and retention of basic and advanced chemical principles.
<p>(ii) Teaching strategies to be used to develop these cognitive skills</p> <ul style="list-style-type: none"> - Making connections between different concepts across the domains. - Using charts and concept maps. - Assigning research questions that can be answered through collecting and analyzing data. - Summarizing the findings of the online research - Class discussions. - Using the Internet to create learning activities.. - Using the instructor's webpage learning activities.

<p>(iii) Methods of assessment of students cognitive skills</p> <ul style="list-style-type: none"> - Discussing and evaluating the topics that students learn from their textbooks and other sources. - Assignments, Midterm Exams and Final examination at the end of semester. - Solving general chemistry problems related to qualitative and quantitative information at the end of each topic. - Individual assignments or oral exam for developing/solving a task.
<p>c. Interpersonal Skills and Responsibility</p>
<p>(i) Description of the interpersonal skills and capacity to carry responsibility to be developed</p> <ul style="list-style-type: none"> - The essential components of communication skills are based on developing critical skills, observation, and feedback. - Encouraging students to use online resources. - Using the Internet to collect statistical data - Using Microsoft Office (e.g. Excel, Microsoft Access, front page) to analyze data and prepare statistical reports.
<p>(ii) Teaching strategies to be used to develop these skills and abilities</p> <ul style="list-style-type: none"> - Using PowerPoint (it's easy to cover more material quickly). - Provide good quality handouts or copies of slides as appropriate (printed no more than four slides).The slides should be clear, well illustrated, referenced and informative. - Group discussion - Online workshops
<p>(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility</p> <ul style="list-style-type: none"> - Assessment of group assignment includes component for individual contribution. - Providing opportunities for observed practice. - Providing feedback. - Encouraging self-assessment during the learning process.
<p>d. Communication, Information Technology and Numerical Skills</p>
<p>(i) Description of the skills to be developed in this domain.</p> <ul style="list-style-type: none"> - Communicating personal ideas and thoughts. - Responding to class discussions. - Developing teamwork skills. - Collaboration to finish team assignments. - Presenting reports on their reading. - What relation of Data, Information, and Knowledge
<p>(ii) Teaching strategies to be used to develop these skills</p> <ul style="list-style-type: none"> - Debates - Group working. - Mini seminars prepared by the students to present their team projects.

(iii) Methods of assessment of students numerical and communication skills - Instructor's feedback - Test questions require solving of simple and advanced general chemistry problems. - Assessments of student's assignments.
e. Psychomotor Skills (if applicable)
(i) Description of the psychomotor skills to be developed and the level of performance required
(ii) Teaching strategies to be used to develop these skills
(iii) Methods of assessment of students psychomotor skills

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	Midterm Examination – I	7	20%
2	Midterm Examination – II	14	20%
3	Assignments	6 & 13	10%
5	Final Examination	16	50%

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 faculty member has 2 hours per week for these cases.

E Learning Resources

1. Required Text(s) Robert B. Jordan , "Reaction mechanisms of inorganic and organometallic systems", New York: Oxford University Press, 2007 ISBN 9780195301007.
2. Essential References 1- "Mechanisms of Inorganic Reactions," Dimitris Katakis and Gilbert Gordon, Wiley-Interscience Publication, 1987, ISBN 0471842583.

2- "Catalysis Without Precious Metals," Ed. R. Morris Bullock, Wiley-VCH, 2010, ISBN 9783527323548.
3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)
1- "Principles and Applications of Organotransition Metal Chemistry," Collman, Hegedus, Norton, Finke, University Science Press, 1987, ISBN 9780935702514. 2- "Homogeneous Catalysis – Understanding the Art," 2004 Ed., Piet W.N.M. van Leeuwen, Kluwer Academic Publishers, 2004, ISBN 1402019998.
4-.Electronic Materials, Web Sites etc
1- "Kinetics and Mechanisms of Reaction of Transition Metal Complexes," Ralph G. Wilkins, 2nd Thoroughly Revised Edition, VCH Publishers, 1992, ISBN 9783527282531 (Online book access at http://onlinelibrary.wiley.com/book/10.1002/3527600825) 2- "Ligand Substitution Processes," C.H. Langford and H.B. Gray, W.A. Benjamin, Inc., 1966 (Online book access at http://caltechbook.library.caltech.edu/100/1/Langford_Lsp.pdf) 3- Lecture Synopsis at http://www.chem.ox.ac.uk/icl/dermot/mechanism1/
5- Other learning material such as computer-based programs/CD, professional standards/regulations
Cases and handouts will be distributed to students

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.)
Air-conditioned rooms (45 seats)
2. Computing resources
MS-Office Software and Internet connection
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)
Overhead projector
Computer for individual students
Internet access

G Course Evaluation and Improvement Processes

<p>1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching</p> <ul style="list-style-type: none">- Confidential completion of standard course evaluation questionnaire.- Focus group discussion with small groups of students.
<p>2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department</p> <ul style="list-style-type: none">- Observations and assistance from colleagues, independent assessment of standards achieved by students,- Independent advice on assignment tasks, etc.
<p>3 Processes for Improvement of Teaching</p> <p style="text-align: center;">Developing the lectures periodically</p>
<p>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)</p> <p style="text-align: center;">Meetings are conducting with teachers for checking the grading of the exams.</p>
<p>5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.</p> <ul style="list-style-type: none">- Teachers' survey- Students' survey