



## Course Specifications

<b>Course Title:</b>	<b>Electrochemistry</b>
<b>Course Code:</b>	<b>430 chem</b>
<b>Program:</b>	<b>B.S. of Science</b>
<b>Department:</b>	<b>Chemistry</b>
<b>College:</b>	<b>Science</b>
<b>Institution:</b>	<b>King Saud University</b>

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## A. Course Identification

<b>1. Credit hours:</b>			
<b>2. Course type</b>			
a.	University <input type="checkbox"/>	College <input type="checkbox"/>	Department <input checked="" type="checkbox"/>
b.	Required <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>	Others <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> 7 <sup>th</sup> level- fourth year			
<b>4. Pre-requisites for this course (if any):</b> 233 chem-335 chem			
<b>5. Co-requisites for this course (if any):</b> None			

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	22	78.5%
2	Blended	4	15.0 %
3	E-learning	2	7.0%
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	28
2	Laboratory/Studio	24
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	<b>52</b>

## B. Course Objectives and Learning Outcomes

<p><b>1. Course Description</b> Electrochemistry (Chem 430)</p>
<p><b>2. Course Main Objective</b></p> <ul style="list-style-type: none"> <li>• Electrochemical processes at liquid/solid interface</li> <li>• Types of potential at interfaces</li> <li>• Expression of electrode reaction rate</li> <li>• Effect of diffusion on electrode reactions</li> <li>• Adsorption from solution</li> <li>• Applications of Electrochemistry : Corrosion</li> </ul>

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge and Understanding</b>	
1.1	To describe the meaning of solid/liquid interface, forces at such interface and processes occurring at it	<b>K1</b>
1.2	To write the rate of electrochemical reactions and know the rate laws of electrode reactions	<b>K2</b>
1.3	To recognize corrosion and its applications.	<b>K3</b>
1...		
<b>2</b>	<b>Skills :</b>	
2.1	To integrate and evaluate the meaning of solid/liquid interface, forces at such interface and processes occurring at it	<b>S1</b>
2.2	To analyse and interpret chemical data by linking the rate of electrochemical reactions with mathematical expressions.	<b>S2</b>
2.3	To develop applications of electrochemical reactions	<b>S3</b>
2.4	To demonstrate appropriate safety techniques and proper use of lab equipment.	<b>S4</b>
2.5	To apply the electrochemical measurements to prove the electrochemical theoretical laws and to determine many thermodynamic functions.	<b>S5</b>
<b>3</b>	<b>Values:</b>	
3.1	To apply rational thinking and propose creative solutions to chemical problems in society with limited guidance.	<b>V1</b>
3.2	To have the responsibility to address electrochemical problems and coordinate effectively whether in a leadership role or as a member of a team.	<b>V2</b>
3.3	To use the ethical dimensions and code of practice on how to deal with the risks associated with hazardous electrochemical chemicals.	<b>V3</b>
3...		

### C. Course Content

No	List of Topics	Contact Hours
1	Interface between solid and liquid and processes occurring at interface	4
2	Electrochemical reactions at interfaces and the electrochemical potential	4
3	Types of electrochemical potentials	2
4	Nernst equation and thermodynamics	6
5	Rate of electrode reaction and over-potential(Butler-Volmer and Tafel equations)	6
6	Cyclic voltammetry and electrode reaction mechanism	2
7	Applications of electrochemistry : Corrosion	2
8	Extra Tutorial	2
8	Practical Measurement of Danial cell Potential- Application of Nernst equation- Application of electrochemical measurements to determine mean activity coefficient, thermodynamic functions and $K_{sp}$ of a salt-Difference between galvanic cell and electrolytic cell- Protection of metal corrosion- Tafel equation- Cyclic Voltammetry	24
<b>Total</b>		<b>52</b>

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1	To describe the meaning of solid/liquid interface, forces at such interface and processes occurring at it	Explaining lectures with discussion with student	The students reply to discussion and including these questions in exams
1.2	To write the rate of electrochemical reactions and know the rate laws of electrode reactions	Applications of examples	The students reply to discussion and including these questions in exams
1.3	To recognize corrosion and its applications.	Explaining lectures and applications of examples	The students reply to discussion and including these questions in exams
<b>2.0</b>	<b>Skills</b>		
2.1	To integrate and evaluate chemical information and data in order to gain a coherent understanding of theory and practice.	Application of electrochemical reactions and laws	Actual solving of numerical exercise
2.2	To analyse and interpret chemical data by linking chemical and physical concepts with mathematical expressions.	Discussion of relevant materials and calculating cell potential and thermodynamic functions	Analyzing graph data and tables and including these questions in exams
2.3	To develop applications of chemical concepts to other areas of science, technology, and industry.	Explaining lectures and applications of examples	The students write essays about other areas of science, technology, and industry
2.4	To use the ethical dimensions and code of practice on how to deal with the risks associated with hazardous electrochemical chemicals.	To perform experiments using the proper methods	Writing lab reports and weekly assessment of experiments
<b>3.0</b>	<b>Values</b>		
3.1	To apply rational thinking and propose creative solutions to chemical problems in society with limited guidance.	Discussion of relevant materials and calculating cell potential and thermodynamic functions	Analyzing graph data and tables and including these questions in exams
3.2	To have the responsibility to address electrochemical problems and coordinate effectively whether in a leadership role or as a member of a team.	Applications of examples	The students reply to discussion and including these questions in exams
3.3	To use the ethical dimensions and code of practice on how to deal with the risks associated with hazardous electrochemical chemicals.	To perform experiments using the proper methods	Writing lab reports and weekly assessment of Experiments

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz	5	5%
2	Mid-exam 1	10	15%
3	Paper presentation About applications of electrochemical concepts to other areas of science, technology, and industry	14	10%
4	Practical assessment	Every week	30%
5			
6			
7			
8			

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- Office hours.
- Contact by e mail

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ol style="list-style-type: none"> <li>1. P. W. Atkins, Physical Chemistry</li> <li>2. D. r. Crow, Principles and Applications of Electrochemistry</li> <li>3. C. Fisher, Electrode Dynamics</li> </ol>
<b>Essential References Materials</b>	D. r. Crow, Principles and Applications of Electrochemistry
<b>Electronic Materials</b>	Data show lectures
<b>Other Learning Materials</b>	Extra lectures & demonstrations from Khan academy

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms, laboratories
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Data show, Smart Board
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Course evaluation with other colleagues	Prof. Abdullah Al Mayouf & Prof. Mohamad Ghanem	Direct discussion
Effectiveness of teaching and assessment using student assessment	Students	Direct from student feed back of course

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	Physical chemistry
<b>Reference No.</b>	
<b>Date</b>	Jan-12-2021