



**ATTACHMENT 2 (e)**

**Course Specifications**

**Kingdom of Saudi Arabia**

**The National Commission for Academic Accreditation & Assessment**

# **Electrochemistry**

**4022143-3**





### Course Specifications

Institution	<b>Umm Al-Qura University</b>	Date of Report: 2017
College/Department	<b>Applied Science /Chemistry Department</b>	

#### A. Course Identification and General Information

1. Course title and code: <b>Electrochemistry / 4022143-3</b>			
2. Credit hours <b>3 (2 theoretical +practical)</b>			
3. Program(s) in which the course is offered. <b>Chemistry and Industrial Chemistry</b> (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course <b>Dr. Ahmad Fawzy</b>			
5. Level/year at which this course is offered <b>4<sup>th</sup> level/second year</b>			
6. Pre-requisites for this course (if any) <b>Chemical Kinetics-Thermodynamics</b>			
7. Co-requisites for this course (if any)			
8. Location if not on main campus: <b>both on El-Abedyah and El-Zaher</b>			
9. Mode of Instruction (mark all that apply)			
a. Traditional classroom	<input checked="" type="checkbox"/>	What percentage?	<input type="text" value="100 %"/>
b. Blended (traditional and online)	<input type="checkbox"/>	What percentage?	<input type="text"/>
c. e-learning	<input type="checkbox"/>	What percentage?	<input type="text"/>
d. Correspondence	<input type="checkbox"/>	What percentage?	<input type="text"/>
f. Other	<input type="checkbox"/>	What percentage?	<input type="text"/>
Comments:			



## B Objectives

What is the main purpose for this course?

- **List types of electrodes and types of electrochemical cells.**
- **Types of standard electrodes and compare them.**
- **Write Nernst equation and solve related problems.**
- **List Faraday's laws and solve relevant problems.**
- **Compare forms of corrosion**
- **List types of fuel cells**

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

- **Using information technology and the Internet to prepare detailed research of everything new in the course.**
- **Number of lecture contact hours will be increased to 4 to allow a chance to introduce new subjects as electrode kinetics and cyclic voltammetry.**
- **Add lectures to review all new applications in the area of specialization through use of explanatory films and presentations (Video Projector), (power point)**
- **Workshops and scientific forums regularly for more information and training.**

## 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
- <b>Introduction to electrochemistry-Types of electrochemical series</b> - <b>Standard redox potentials</b>	<b>2</b>	<b>4</b>
- <b>Cell potential</b>	<b>1</b>	<b>2</b>
- <b>Electrode potential and Nernst equation.</b>	<b>1</b>	<b>2</b>
- <b>Electrochemical series</b>	<b>1</b>	<b>2</b>
- <b>First exam</b>	<b>1</b>	<b>2</b>
- <b>Standard electrode potentials- Hydrogen and oxygen electrodes</b>	<b>1</b>	<b>2</b>
- <b>Concentration cells</b>	<b>1</b>	<b>2</b>



- Applications on cell potential	2	4
- Second exam	1	2
- Batteries and Fuel cells	1	2
- Forms of corrosion	2	4
- Corrosion Inhibition	1	2
- Final exam	1	2

*Laboratory Part*

Experiment	No. of weeks	Contact hours
Daniell Cell	1	3
Concentration cells	1	3
Electrodeposition at electrodes	1	3
Measurements of cell potential	1	3
Determination of solubility of sparingly soluble salt	1	3
Electroplating	1	3
Measurements of some electrochemical parameters from Tafel Plots	1	3
Determination of the corrosion inhibition efficiency of some inhibitors using Tafel plots	1	3
Determination of corrosion rates using weight loss method	1	3
Determination of the corrosion inhibition efficiency of some inhibitors using weight loss method	1	3
Determination of corrosion rates using thermometric method	1	3
Determination of the corrosion inhibition efficiency of some inhibitors using thermometric method	1	3
Revision	1	3
Final exam	1	3





2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	28		42			70
Credit	2		1		1	3

3. Additional private study/learning hours expected for students per week. : 2hr
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4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy
<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>

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		
1.1	To know terminology of electrochemistry	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> <li>• Library visits</li> <li>• Web-based study</li> </ul>	<ul style="list-style-type: none"> <li>• Exams</li> <li>• web-based student performance systems</li> <li>• portfolios</li> <li>• long and short essays posters lab manuals</li> </ul>
1.2	Write Nernst equation for determination of cell potential		
1.3	List the applications of galvanic cells		
1.4	List types of electrodes		
1.5	To write about forms of corrosion		
1.6	To mention types of fuel cells		
2.0	Cognitive Skills		
2.1	Compare types of electrochemical cells and the	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> </ul>	<ul style="list-style-type: none"> <li>• web-based student performance systems</li> </ul>



	<b>reaction at the half cells</b>	<ul style="list-style-type: none"> <li>• Library visits</li> <li>• Web-based study</li> </ul>	<ul style="list-style-type: none"> <li>• portfolios</li> <li>• posters</li> <li>• demonstrations</li> </ul>
2.2	<b>Solve Problems on Nernst equation</b>		
2.3	<b>Solve problems on Faraday's laws</b>		
2.4	<b>Apply Faraday's laws for calculating the amount deposited at electrodes</b>		
2.5	<b>Predict an assembly of galvanic cell</b>		
2.6	<b>Compare types of fuel cells</b>		
2.7	<b>Compare methods of inhibition of corrosion</b>		
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
	<ul style="list-style-type: none"> <li>• Ability to work in a team to perform a specific experimental tasks.</li> <li>• Ability to work independently to handle chemicals</li> <li>• Ability to communicate results of work to classmate and participation in class or laboratory discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Class discussions</li> <li>• Research activities</li> </ul>	<ul style="list-style-type: none"> <li>• Performance on in-practical exams.</li> <li>• Work on research activity.</li> <li>• Overall student performance in Lab. discussions</li> <li>• Cross questions after finishing laboratory work</li> </ul>
<b>4.0</b>	<b>Communication, Information Technology, Numerical</b>		
4.1	- <b>The ability to debate and dialogue with clear scientific method.</b>	<ul style="list-style-type: none"> <li>- Lectures</li> <li>- Scientific discussion</li> <li>- Library visits</li> <li>- Web-based study</li> </ul>	<ul style="list-style-type: none"> <li>- web-based student performance systems</li> <li>- individual and group presentations</li> </ul>
4.2	<b>The ability to present or explain scientific topic.</b>		
<b>5.0</b>	<b>Psychomotor</b>		
	Laboratory practice . including 1.Locate Materials Safety Data Sheets, chemicals carcinogens list, and hazardous chemicals list. 2. Handle chemicals safely with a proper PPE 3.Dilute solutions, repeat analysis and calculate true result for all procedures performed as required. 4.Pipette accurately at all times 5.Dispose the hazardous solution in right way	Practical session should include both demonstration and experiments .	1.Repetition of the experiments , to reproduce the results 2.Written report of chart and procedures. 3.The students should be able to correlate their results with experimental conditions

#### 5. Schedule of Assessment Tasks for Students During the Semester

Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
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1	Homework or activities.	--	10 %
2	Midterm Exam.	8	20 %
3	Practical Exam.	14	30 %
4	Final Exam.(2 hours exam)	16	40 %
5	<b>Total</b>		<b>100 %</b>

#### D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

- **We have faculty members to provide counseling and advice.**
- **Office hours: During the working hours weekly.**
- **Academic Advising for students.**

#### E. Learning Resources

1. List Required Textbooks

**Electrochemistry Principles, Methods and Applications, Christopher M. A. Brett, Maria Oliveira Brett, Oxford University Press, 2005.**

2. List Essential References Materials (Journals, Reports, etc.)

1. **A.J. Bard ,L.R. Faulkner, Electrochemical Methods , Fundamental and Applications,2010 John Wiley & Sons**
2. **Handbook of Electrochemistry, Cynthia Zosk, Elsevier, 2011.**
3. **Handbook of Corrosion Engineering (Chinese), Pierre R. Roberge, McGraw-Hill, 2005.**
4. **Corrosion Basics: An Introduction, Pierre R. Roberge, NACE International, 2006.**

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

4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.)



- <http://www.chemweb.com>
- <http://www.sciencedirect.com>

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

## F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

- **Classrooms capacity (30) students.**
- **Providing hall of teaching aids including computers and projector.**

2. Computing resources (AV, data show, Smart Board, software, etc.)

- **Room equipped with computer and projector.**

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

- **No other requirements.**

## G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching  
Complete the questionnaire evaluation of the course in particular.

2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor

- **Observations and the assistance of colleagues.**
- **Independent evaluation for extent to achieve students the standards.**
- **Independent advice of the duties and tasks.**

3 Processes for Improvement of Teaching

- **Workshops for teaching methods.**
- **Continuous training of member staff.**
- **Review of strategies proposed.**
- **Providing new tools for learning.**
- **The application of e-learning.**





- **Exchange of experiences internal and external.**

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)

- **Check marking of a sample of exam papers, or student work.**
- **Exchange corrected sample of assignments or exam basis with another staff member for the same course in other faculty.**

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

- **Periodic Review of the contents of the syllabus and modify the negatives.**
- **Consult other staff of the course.**
- **Hosting a visiting staff to evaluate of the course.**
- **Workshops for teachers of the course.**

Faculty or Teaching Staff: **Dr. Ahmed Fawzy**

Signature:

Date Report Completed: 12/1/2019

Received by: **Dr. Ismail Althagafi** Department Head

Signature:

Date: 20/1/2019

