جامعة : المنصورة

كـــلية : العلوم

قسم / الكيمياء

توصيف مقرر دراسى

١- بيانات المقرر		
الرمز الكود :ك٢ ٤ ٤	**أسم المقرر:**Advanced Electrochemistry	**المستوى : الرابع**
البرنامج : الكيمياء	**عدد الوحدات الدراسية: ٢ نظرى : ٢ تمارين: ١ عملى:٠**	

٢- هدف المقرر:	**For students undertaking this course, the aims are to:** 1 - understand the meaning of electrochemistry as a branch of physical chemistry 2 - manifest how chemical energy be transferred to electrical energy and vice versa 3 - Know the meaning of reversible and irreversible electrode, the meaning of overpotential and how to measure it. 4 - Studying concentration and activation overpotential and the Tafel equation 5 - Studying the different types of electrochemical cells: Primary, Secondary, Fuel cells.
٣- المستهدف من التدريس المقرر:	
أ-المعلومات والمفاهيم:	**a- Knowledge and Understanding :** a - 1 - Know the meaning of electrode and how to build an electrochemical cell. a - 2 - Applying thermodynamic concepts to cell e.m.f measurements. a - 3 - Use of measured cell e.m.f for calculating heat change, entropy change and equilibrium constant of the cell reaction. **On completing this course, students will be able to:**
ب-المهارات الذهنية	**b- Intellectual Skills: On completing this course, students will be able to:**

b - 1 - Use of measured cell e.m.f for measuring the acidity (or alkalinity) of a solution. Use of measured cell e.m.f for measuring the acidity (or alkalinity) of a solution. b - 2 - Use of measured cell e.m.f in electroanalytical purposes b - 3 - Use of measured cell e.m.f in determining ionic transport number.	
c-Professional and Practical Skills: On completing this course, c - 1 - The student is able to overview the importance of electrochemistry since the use of fuel cells in space ships c - 2 - The student is able to understand how chemical energy be transferred to electrical energy and vice versa. **students will be able to:**	**ج- المهارات المهنية** **الخاصة بالمقرر:**
d-General and Transferable Skills: On completing this course, students will be able to: d - 1 - The student is able to use e.m.f measurements in pharmaceutical aspects d - 2 - The student is able to use e.m.f measurements in biological needs by measuring the acidity(or alkalinity) in urine or blood serum	**د- المهارات العامة :**
1- Meaning of electrochemistry - electrode potential and cell e.m.f - Standard cell and cell e.m.f measurement 2- e.m.f calculations from thermodynamic concepts- calculating heat change, entropy change and equilibrium from cell e.m.f 3- Types of reversible electrodes: Metal-metal ion, amalgam, metal-insoluble ion-, metal-insoluble oxide, gas electrode, oxidation reduction electrode, glass electrode. Types of reversible electrodes: Metal-metal ion, amalgam, metal-insoluble ion-, metal-insoluble oxide, gas electrode, oxidation reduction electrode, glass electrode. 4- Types of cells : Chemical cells without transference-Chemical cells with transference-Concentration cell without transference-Concentration cell with transference-Liquid junction potential 5- Application of e.m.f measurements: for measuring the acidity (or alkalinity) of a solution - In potentiometric titrations - In measuring ionic transport number - In measuring activity coefficient. 6- Activation overpotential -Methods of measuring overpotential -	**٤- محتوى المقرر:**

Decomposition potential.

7- Concentration overpotential: Meaning and evaluating its value - Factors affecting concentration overpotential.

8- Activation overpotential : Meaning- Butler-Volmer equation, Tafel equation-Exchange current- Cathodic evolution of hydrogen- Oxygen overpotential

9- Electrochemical cells as source of energy. Primary cells with examples - Secondary cells with examples - Fuel cells with examples

10- Practical

٥- اساليب التعليم والتعلم:

1 - Classical lecture using the white board

2 - Report

3 - Home work

4 - Data show

٦- أساليب التعليم والتعلم للطلاب ذوى القدرات المحدودة:

The same as normal students, only skeletal disabilities are allowed in the Faculty of Science.

٧- تقويم الطلاب :

أ- الأساليب المستخدمة :

7- Student Assessment Methods

Practical exam	**To assess**	c1-c3
Final exam	**to assess**	a1-a3, b1-b3
Oral exam	**to assess**	a1-a3, b1-b3
Mid-term exam	**To assess**	a1-a3, b1-b3
Report	**to assess**	d1 - d3

ب- التوقيت :

Assessment Schedule

Assessment 1	**Week #final exam**	**Week 14**
Assessment 2	**Week #oral exam**	**Week 14**
Assessment 3	**Week #practical exam**	**Week 12**
Assessment 4	**Week #mid-term exam**	**Week 7**
Assessment 5	**Week #report**	**Week 10**

ج- توزيع الدرجات :

Weighting of Assessments

Final-Term Examination	**60%**
Oral Examination	**10%**
Practical Examination	**20%**
Semester work	**0%**
Mid-term examination	**10%**
Other types of assessment	**0%**
Total	**100%**

٨- قائمة الكتب الدراسية والمراجع :

أ- مذكرات:

ب- كتب ملزمة

1 - Daniels and Alberty- Text book of physical chemistry

2 - Glastone - Text book of physical chemistry

ج- كتب مقترحة :

د- دوريات علمية أو نشرات..

مصفوفة المعارف والمهارات المستهدفة من المقرر الدراسى

المحتويات للمقرر	أسبوع الدراسة	المعارف الرئيسية	مهارات ذهنية	مهارات مهنية	مهارات عامة
Meaning of electrochemistry - electrode potential and cell e.m.f - Standard cell and cell e.m.f measurement-	1	a1,a2	b1	b1	
e.m.f calculations from thermodynamic concepts- calculating heat change, entropy change and equilibrium from cell e.m.f	2	a1,a2,a3	b1,b2	b1,b2	
Types of reversible electrodes: Metal-metal ion, amalgam, metal-insoluble ion-, metal-insoluble oxide, gas electrode, oxidation reduction electrode, glass electrode.	3,4	a1,a2	b1	b1	
Types of cells : Chemical cells without transference-Chemical cells with transference-Concentration cell without transference-Concentration cell with transference-Liquid junction potential	5,6	a1,a2	b1,b2, b3	b1,b2, b3	d1, d2
Application of e.m.f measurements: for measuring the acidity (or alkalinity) of a solution - In potentiometric titrations - In measuring ionic transport number - In measuring activity coefficient.	7	a1,a2	b1,b2, b3	b1,b2, b3	d1, d2
Activation overpotential -Methods of measuring overpotential - Decomposition potential.	8,9	a2	b1	b1	
Concentration overpotential: Meaning and evaluating its value - Factors affecting concentration overpotential.	10	a1,a2	b1	b1	d1, d2

Activation overpotential : Meaning- Butler-Volmer equation, Tafel equation-Exchange current- Cathodic evolution of hydrogen- Oxygen overpotential	11-12	a1,a2	b1,b2	c1,c2	
Electrochemical cells as source of energy. Primary cells with examples - Secondary cells with examples - Fuel cells with examples	13-14	a1,a2	b1,b2	c1,c2	
Practical electrochemical measurement	1-12	a1	b1,b2	c2	d1, d2

أستاذ المادة : ا.د/ هانم عبد الرسول مصطفى محمد

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