**جامعة : المنصورة**

**كـــلية : العلوم**

**قسم / الكيمياء**

**توصيف مقرر دراسى**

| ١- بيانات المقرر | | |
|---|---|---|
| **الرمز الكود :ك٣٤١** | **أسم المقرر**: Electrochemistry | **المستوى : الثالث** |
| **البرنامج : الكيمياء** | **عدد الوحدات الدراسية: ٣ نظرى : ٢ تمارين: - عملى:٣** | |

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

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| b - 1 - Use of measured cell emf for measuring the acidity(or alkalinity) of a solution<br>b - 2 - Use of measured cell emf in electroanalytical purposes<br>b - 3 - Use of measured cell emf in determining ionic transport number. | |
| **c-Professional and Practical Skills: On completing this course,**<br>c - 1 - The student is able to overview the importance of electrochemistry since the use of fuel cells in space ships<br>c - 2 - The student is able to understand how chemical energy be transferred to electrical energy and vice versa.<br>**students will be able to:** | **ج- المهارات المهنية الخاصة بالمقرر:** |
| **d-General and Transferable Skills: On completing this course, students**<br>d - 1 - The student is able to use emf measurements in pharmaceutical aspects.<br>d - 2 - The student is able to use emf measurements in biological needs by measuring the acidity(or alkalinity) in urine or blood serum<br>**will be able to:** | **د- المهارات العامة :** |

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| ٤- محتوى المقرر: | 1- Meaning of electrochemistry - electrode potential and cell emf - Standard cell and cell emf measurement-<br>2- emf calculations from thermodynamic concepts- calculating heat change, entropy change and equilibrium from cell emf<br>3- Types of reversible electrodes: Metal-metal ion, amalgam, metal-insoluble ion-, metal-insoluble oxide, gas electrode, oxidation reduction electrode, glass electrode.<br>4- Types of cells : Chemical cells without transference-Chemical cells with transference-Concentration cell without transference-Concentration cell with transference-Liquid junction potential<br>5- Application of emf measurements: for measuring the acidity (or alkalinity) of a solution - In potentiometer titrations - In measuring ionic transport number - In measuring activity coefficient.<br>6- Activation overpotential -Methods of measuring over potential - Decomposition potential.<br>7- Concentration overpotential: Meaning and evaluating its value - Factors affecting concentration overpotential.<br>8- Activation overpotential : Meaning- Butler-Volmer equation, Tafel equation- Exchange current- Cathodic evolution of hydrogen- Oxygen overpotential<br>9- Electrochemical cells as source of energy. Primary cells with examples - Secondary cells with examples - Fuel cells with examples<br>10- Practical |
| ٥- اساليب التعليم والتعلم: | 1 - Classical lecture using the white board<br>2 - Report<br>3 - Home work<br>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*

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| **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**

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|---|---|---|
| **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*

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

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|---|---|---|---|
| **Total** | **100%** | | |
| **٨- قائمة الكتب الدراسية والمراجع :** | | | |
| **أ- مذكرات:** | 1 - Daniels and Alberty- Text book of physical chemistry | | |
| **ب- كتب ملزمة** | | | |
| **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 | c1 | |
| 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 | c2 | |
| 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 | c1,c2 | |
| Types of cells : Chemical cells without transference-Chemical | 5,6 | a1,a2 | b1,b2,b3 | | d1,d2 |

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|---|---|---|---|---|---|
| cells with transference-Concentration cell without transference-Concentration cell with transference-Liquid junction potential | | | | | |
| 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 | c1 | d1,d2 |
| Activation overpotential - Methods of measuring overpotential - Decomposition potential. | 8,9 | a2 | b1 | | |
| Concentration over potential: Meaning and evaluating its value - Factors affecting concentration over potential. | 10 | a1,a2 | b1 | c2 | d1,d2 |
| Activation over potential : Meaning- Butler-Volmer equation, Tafel equation- Exchange current- Cathodic evolution of hydrogen- Oxygen over potential | 11,12 | a1,a2 | b1,b2 | | |
| 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/ عبد العزيز السيد السيد فوده**

**رئيس مجلس القسم العلمي : أ.د /سالم السيد سمرة**