Course Description of

1. Physical Chemistry VII (Electrochemistry and Corrosion).

   - The program which is offered from within the program.
   - The program is responsible for the program.
   - The scientific department is responsible for teaching the program.
   - The academic section of the program (fourth year, second semester).
   - The academic section of the program (fourth year, first semester).
   - The date of approval of the program.

Basic Data

(1) Course Title: Physical Chemistry VII
(2) Course Code No.: Ch 432
(3) Credit Hours: SIX credit hours
   - Lectures: Lec 2 hrs
   - Rec: 4 hrs
   - Total hours: 6 credit hours

Course Description: The study of Electrochemical cells, Nernst equation, measurement of PH, Batteries and accumulators. The study of corrosion phenomena.

Professional Data

1) General goals of the course

   - The course is designed to help student-teachers achieve the following goals:
     - Review Oxidation – Reduction reactions in galvanic cells.
     - Compare between galvanic and electrolytic cells.
     - Recognize the different applications of galvanic cells in lab and industry.
     - Understand the relationship between electrochemistry and corrosion.
     - Discuss the Theories, mechanisms and protection from corrosion.
2) Operational learning objectives of the course

By the end of this course, student teachers are expected to achieve the following objectives:

A) Knowledge and Comprehension:

- Describes the types of electrochemical cells.
- Calculates the emf and free energy changes for galvanic cells based on Nernest equation.
- Computes thermodynamics data from emf calculations.
- Classifies different types of electrodes.
- Recognize the difference between batteries, accumulators, and fuel cells.
- Understand the phenomena and mechanism of corrosion and protection.

B) Cognitive Skills:

- Apply mathematics, including calculus and statistics, to investigations in chemistry and the analysis of data.
- Relate the concepts of chemistry to contemporary, historical, technological, and societal issues; in particular, relate concepts of chemistry to current controversies, such as those around energy uses and medical research, as well as other issues.

C) Practical Skills:

- Locate resources, design and conduct inquiry-based open-ended investigations in chemistry, interpret findings, communicate results, and make judgments based on evidence.
- Construct new knowledge for themselves through research, reading and discussion, and reflect in an informed way on the role of science in human affairs.
- Explain and promote the maintenance of a safe science classroom, including the appropriate use and storage of scientific equipment, and the safe storage, use, and disposal of chemicals.

D) Enabling Skills:

- Demonstrate competence in the practice of teaching as defined within the Entry-Level Standards.
- Create and maintain an educational environment in which conceptual understanding will occur for all science students.
- Demonstrate competence in the practice of teaching through investigative experiences and by demonstrating the application of the scientific process and assessing student learning through multiple processes.
- Develop an understanding and appreciation for the nature of scientific inquiry.
- Explain chemistry as the study of the composition, structure, properties, reactions of matter, and the dynamic interrelations of matter.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assigned hours</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
</tr>
<tr>
<td>First</td>
<td><strong>Electrochemistry:</strong> Types of electrodes,</td>
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<tr>
<td>Second</td>
<td><strong>Electrochemical cells</strong></td>
<td>2</td>
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<tr>
<td>Third</td>
<td><strong>emf and redox reactions</strong></td>
<td>2</td>
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<tr>
<td>Fourth</td>
<td><strong>Free energy changes for cell reactions, standard emf, electrode potential</strong></td>
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<tr>
<td>Fifth</td>
<td><strong>Nemest equation, thermodynamic data from emf measurements and applications</strong></td>
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<tr>
<td>Sixth</td>
<td><strong>Electrodes and PH measurement, concentration cells, batteries, accumulators and fuel cells.</strong></td>
<td>2</td>
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<tr>
<td>Seventh</td>
<td><strong>Corrosion:</strong> Types, theories and mechanisms, passivity and pitting</td>
<td>2</td>
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<tr>
<td>Eighth</td>
<td><strong>Irreversible thermodynamics of corrosion, corrosion rates, protection.</strong></td>
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<tr>
<td>Ninth</td>
<td><strong>Amf measurement of electrochemical cells</strong></td>
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<tr>
<td>Tenth</td>
<td><strong>Temperature dependence</strong></td>
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<tr>
<td>Eleventh</td>
<td><strong>Calculations of thermodynamics parameters from emf temperature dependence, potentiometric titrations</strong></td>
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<tr>
<td>Twelfth</td>
<td><strong>Measurements of corrosion rates, corrosion protection and inhibition.</strong></td>
<td>2</td>
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<tr>
<td>Thirteenth</td>
<td><strong>First assessment</strong></td>
<td>2</td>
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Activities, tasks and assignments:

- Solve and discuss problem sets.
- Submission and class presentation of term papers.
- Computer aided and web based assignments and assessment.
- Computational modeling, and simulation assignments, groups discussions, interpenetration of data, and reports on pertinent materials included in the course.

Summative Evaluation table

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Score</th>
<th>Weight</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1. Final examination</td>
<td>70%</td>
<td>1.</td>
<td>70%</td>
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<tr>
<td>2. Practical exam</td>
<td>20%</td>
<td>2.</td>
<td>20%</td>
</tr>
<tr>
<td>3. Assignments</td>
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<td>3.</td>
<td>10%</td>
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<tr>
<td>Total</td>
<td>%100</td>
<td>4.</td>
<td>%100</td>
</tr>
</tbody>
</table>

References:


كتب المحاضر:
1- schaum's Outline of Physical Chemistry (2nd Edi... by Clyde Metz
2- Cracking the GRE Chemistry Test, 3rd Edition... by Princeton Review
3- GRE Chemistry (REA) - The Best Test P by Staff of Research
4- Instant Notes in Physical Chemistry by Gavin Whittaker

- WWW Virtual Library - Chemistry
- ChemDex-Sheffield List of Chemistry internet Sites
- www.carolina.com/product/physical+science/chemistry/che..
- www.ecampus.com/book/067352342X.
- Chemical Information Sources from Indiana University

- Internet Resources: Chemistry
الإمكانات المطلوبة للتعليم والتعلم

Educational sources:

- Chemistry library
- Textbooks
- Handouts and problem sets.
- Electronic, web, and multimedia based resources.
- Advanced molecular modeling software.
- Computational assignments.
- Lab work.

Course coordinator: د.محمد عبده اللطيف

Head of the Department: د.محمد عبده اللطيف

Date: 12/10/2009