Course Description of Inorganic Chemistry IV (Nuclear and Radiochemistry)

The course deals with the stability and radioactive decay of elements, nuclear transformation, detection and applications of radioactivity, reviews biological implications of radiation damage.

Professional Data

1) General goals of the course

- The course is designed to help student-teachers achieve the following goals:
  - Explore the energetics of nuclear fission and fusion.
  - Describe the principles of operation of nuclear reactors.
  - Recognize radiation damage to environment and humans.
  - Identify industrial and medical uses of isotopes.

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:

- Relate the stability of the nucleus.
- Classify types of radioactive decay.
- Define and calculate the half life of radioactive nuclei.
• Review the element transformation.
• Discuss radioactivity detection devices.
• Discuss thermodynamics stability of the nucleus.
• Calculate the binding energy.
• Discuss nuclear fission and fusion.
• Describe nuclear reactors.
• Define uses of isotopes
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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.
• Understand 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.
- Understand chemistry as the study of the composition, structure, properties, reactions of matter, and the dynamic interrelations of matter.

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<tr>
<th>Week</th>
<th>Topic</th>
<th>Assigned hours</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
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<tr>
<td>First</td>
<td><strong>Nuclear and Radiochemistry</strong></td>
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<tr>
<td></td>
<td><strong>Nuclear stability</strong></td>
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<td>Second</td>
<td><strong>radioactive decay</strong></td>
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<td>Third</td>
<td><strong>The Kinetics of radioactive decay</strong></td>
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<td>Fourth</td>
<td><strong>Nuclear transformations</strong></td>
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<td>Fifth</td>
<td><strong>uses of radioactivity</strong></td>
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<td>Sixth</td>
<td><strong>Detection</strong></td>
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<td>Seventh</td>
<td><strong>Dating by radioactivity</strong></td>
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<td>Eighth</td>
<td><strong>Medical applications of radioactivity</strong></td>
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<tr>
<td>Ninth</td>
<td><strong>Thermodynamics stability of the nucleus</strong></td>
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<tr>
<td>Tenth</td>
<td><strong>Nuclear fission and fusion</strong></td>
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<td>Eleventh</td>
<td><strong>Nuclear reactors</strong></td>
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<td>Twelfth</td>
<td><strong>Breeder reactors</strong></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>التقييم</th>
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<tbody>
<tr>
<td>2. Final written exam</td>
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<td>1. امتحان نهاية الفصل الدراسي</td>
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<td>3. Practical exam</td>
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<td>%100</td>
<td>100%</td>
<td>المجموع</td>
</tr>
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</table>

References:


**كتب المحاضر:**

1- *Schum's Outline of Physical Chemistry (2nd Ed...* 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

**المجلات العلمية و مواقع الانترنت:**

- **WWW Virtual Library - Chemistry**
- **ChemDex-Sheffield List of Chemistry**
- **Internet Resources: Chemistry**
- **Internet Resources: Chemistry**
- **Educational sources:**
  - Chemistry library.
  - Textbooks
  - Handouts and problem sets
  * Electronic, web, and multimedia based resources
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Course coordinator: د. محمد عبد اللطيف
Head of the Department: أ.د. مدحت شاكر
Date: التـاريخ: 12/10/2009 م