Course Description of Analytical Chemistry II (Instrumental Methods of Chemical Analysis)

- The program that offers this course from its initiations (Program of Preparatory Year)
- The course was designed and supervised by the Department of Chemistry (Qasim University)
- The scientific section responsible for the course (Chemistry Department)
- The academic section responsible for teaching the course (Chemistry Department)
- The academic level of the course (Third Year of Preparatory Year – Chemistry Faculty / Second Term)
- The date of approval of the course (Year / Month / Day)

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Basic Data

(1) Course Title : Analytical Chemistry II (Instrumental Methods of Chemical Analysis)

(2) Course Code No.: 312

(3) Credit Hours :
- Lectures : Four credit hours
- Laboratory practice : 2 credit hour
- Total hours: 4 credit hours

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Course Description: The course deals with different spectroscopic studies of organic and inorganic compounds, chromatographic, potentiometric and polarographic and described as well.

Professional Data

1) General goals of the course

- The course is designed to help student-teachers achieve the following goals:
  - Explain the theoretical basis of different spectroscopic measurements.
  - Elucidate chemical structure of compounds using spectroscopic measurements.
  - Understand the concepts of differential thermal analysis and its wide range applications.
Recognize uses of chromatographic and voltaic methods in analytical chemistry.

2) Operational learning objectives of the course الأهداف الإجرائية للمقرر

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

A) Knowledge and Comprehension:
- Explain the theories and techniques of spectroscopic analysis.
- Recognize the structure of Chemical compounds using spectroscopic and other instrumental techniques.
- Explain the concepts of different chromatographic, thermal, and voltaic techniques.

B) Cognitive Skills:
- Develop an understanding and appreciation for the nature of scientific inquiry in environmental chemistry.
- Apply mathematics, including calculus and statistics, to investigations in environmental chemistry and the analysis of data.
- Locate resources, design and conduct inquiry-based open-ended investigations in environmental chemistry, interpret findings, communicate results, and make judgments based on evidence.

Practical Skills:
- Locate the appropriate use and storage of scientific equipment.
- Use safe storage, use, and disposal of materials.
- Acquire basic lab skills.

Enabling Skills:
1- Relate the concepts of environmental chemistry to contemporary, historical, technological, and societial issues.
2- Relate concepts of environmental chemistry to current controversies, such as those around energy uses and medical research, as well as other issues.
3- Construct new knowledge for themselves through research, reading and discussion, and reflect in an informed way on the role of environmental chemistry in human affairs.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assigned hours</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Lectures</td>
</tr>
<tr>
<td>First</td>
<td>methods of Chemical Analysis.</td>
<td>4</td>
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<tr>
<td>Second</td>
<td>Instrumental Understand the theoretical basis of different spectroscopic measurement</td>
<td>4</td>
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<tr>
<td>Third</td>
<td>Elucidate chemical structure of compounds using spectroscopic measurements</td>
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<tr>
<td>Fourth</td>
<td>Understand the concept of differential thermal analysis</td>
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<td>Fifth</td>
<td>Recognize its wide ranging application</td>
<td>4</td>
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<tr>
<td>Sixth</td>
<td>Recognize uses of chromatographic</td>
<td>4</td>
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<tr>
<td>Seventh</td>
<td>Recognize uses of voltaic methods in analytical chemistry</td>
<td>4</td>
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<tr>
<td>Eighth</td>
<td>Experiments using UV, VIS</td>
<td>4</td>
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<tr>
<td>Ninth</td>
<td>Experiments using IR,</td>
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<tr>
<td>Tenth</td>
<td>Structural studies employing mass spec</td>
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<tr>
<td>Eleventh</td>
<td>Experiments using NMR spectrocope</td>
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<tr>
<td>Twelfth</td>
<td>Electrochemical analytical experiments</td>
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<tr>
<td>Thirteenth</td>
<td>Chromatographic separations</td>
<td>4</td>
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<tr>
<td>fourteen</td>
<td>Thermal analysis experiment</td>
<td>4</td>
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<tr>
<td>fifteen</td>
<td>first Assessment</td>
<td>4</td>
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Activities, tasks, and assignments

- Solves and discusses problem sets.
- Submission and class presentation of term papers.
- Computer aided and web based assignments and assessment.
- Visits to related establishments and submission of subsequent reports for group discussion.
- Laboratory work, group discussions, and reports on: quantitative experiments employing instrumental methods and techniques

Summative Evaluation table

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weight (%)</th>
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<tbody>
<tr>
<td>First Assessment</td>
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<tr>
<td>Final exam</td>
<td></td>
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<tr>
<td>Fifteenth Week</td>
<td></td>
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<tr>
<td>Fiftieth Week</td>
<td></td>
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<tr>
<td>Final exam</td>
<td>70</td>
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<tr>
<td>Final oral exam</td>
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<tr>
<td>Assignments</td>
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</tr>
<tr>
<td>Total</td>
<td>100</td>
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</tbody>
</table>

- Weight in terms of percentage.

Results of evaluation:

1. Final exam of the academic year: 70%
2. Final oral exam: 20%
3. Academic assignments: 10%
4. Total: 100%
References

Students’ Textbooks

1- Reference materials in analytical chemistry: a guide for selection and use - Page 1 by Adolf Zschunk

2- Analytical chemistry

3- Applications of reference materials in analytical chemistry - Page 1 by Peter Roper, Royal Society of Chemistry (Great Britain) - Science - 2001 - 147 pages

4- Handbook on metals in clinical and analytical chemistry - Page 105 by Helmut Sigel, Astrid Sigel

Lecturer’s References

1- Some fundamentals of analytical chemistry: a symposium presented at the ... - Page 1 by American Society for Testing and Materials

2- Principles of analytical chemistry: a textbook - Page 102 by Miguel Valcárcel,

3- Modern polarographic methods in analytical chemistry - Page 80 by Alan Maxwell Bond

4- Analytical chemistry of aerosols - Page 19

5- by Květoslav Spurný - Talanta Volume 51, Issue 5, p921-933 [2], Review of analytical next term measurements facilitated by drop formation technology

6- TrAC Trends in Analytical Chemistry Volume 21, Issues 7--10, Pages 547-557 [3], History of gas chromatography


16- Elsevier. "Analytica Chimica Acta

Periodicals and websites

1- www.chemlin.net/market/analytical_instruments.htm
2- www.files.chem.vt.edu/chem-ed/ac-meths.html
3- www-rohan.sdsu.edu/staff/drjackm/chemistry/.../analyt27.html

Educational Resources

- Chemistry library
- Textbooks
- Handouts and problem sets.
- Electronic, web, and multimedia based resources.
- Lab work.

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Head of the Department: أ. د. محمد شاكر
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