## Course specification

**University/Academy:** Damanhour University  
**Faculty/Institute:** Science  
**Department:** Chemistry

### 1. course Data:

<table>
<thead>
<tr>
<th>Course code:</th>
<th>Course title:</th>
<th>Academic year/level:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 403</td>
<td>Physical Chemistry 6</td>
<td>2010-2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specialization:</th>
<th>No. of instructional units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Chemistry</td>
<td>lecture 3hrs/week, tutorial 3hrs/week, practical 6 hrs/week</td>
</tr>
</tbody>
</table>

### 2. course Aim

By the end of this course, students should be able to:

*This course is designed to give advanced ideas on phase equilibria, physical chemistry of high polymers and electrochemistry that may be required by chemists in the course of their careers. The course is aimed to provide practical training for students in laboratory techniques, methods, instrumentation, and data analysis.*

### 3. Intended learning outcome

#### a) Knowledge and understanding

By the end of this course, students should be able to:

At the end of this course the students will be able to:

- a1- Illustrate phase equilibria of different component
- a2- Mention monomers, oligomers and polymers, identify shape of polymers, recognize the chemical structure and discuss thermodynamics of polymers in solution.
- a3- Define on the advanced Electrochemistry

#### b) Intellectual skills

At the end of this course the students will be able to:

- b1- Contrast knowledge and understanding of essential facts, concepts, principles and theories relating to chemistry problems.
- b2- Apply such knowledge and understanding to the solution of qualitative and quantitative problems of a familiar and unfamiliar nature.
- b3- Represent scientific material both orally and in writing in a scholarly
c) Professional skills

At the end of this course students will have the ability to:

c1- use their practical skills and understand the scientific approach in Physical chemistry of high polymers, electrochemistry and phase rule.
c2- examin the polymeric structure

c3- Report the best solvent used in dissolution of polymers from studying dissolution and kinetics of swelling and solve problems related to physical chemistry of high polymers.

d) General skills

At the end of this course students will have:

d1- Work in groups,
d2. Use information and communication technology.
d3- write report, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.

4. course content

**Phase equilibria:**
introduction, homo- and heterogeneous equilibrium, definitions of P, C and F.
- Deduction of the phase rule equation,
- Thermodynamic treatment of the phase rule (Clausius- Clapeyron Equation).
One component systems: (water system and CO2 system).
- One component systems: (sulfur system),
- Two component systems: classification,
- Two component systems continued
Two component systems: solid-liquid equilibria , eutectic systems with completely miscible liquids, and with partially miscible liquids.
Two component systems: solid-liquid equilibria , eutectic systems exhibiting congruent and incongruent melting point
Two component systems: Solid solution, completely miscible, ideal non ideal solid solution, partial miscible solid solution.
Three component systems: Construction of the phase diagram, System of three liquids, Plait point, effect of temperature.
Three component systems: retrograde solubility, three components system with two and three pairs of partially miscible liquids. Three component systems with two salts and liquid

**Electrochemistry (2):**
Introduction
- Debye- Hückel theory.
- Ion association
- Ion solvent interaction.
- Ion solvent interaction (continued)
Models and theories of electric double layer.
- Models and theories of electric double layer (continued)
- Electrocapillary phenomenon
- Kinetics of electrode processes (continued)
- Polarization and overvoltage
- Polarization and overvoltage (continued)
- Kinetics of electrode process
- Kinetics of electrode process (continued)
- Introduction to corrosion

**Physical Chemistry of high polymers:**
- Chemical structure of monomers.
- Chemical structure polymers
- Synthesis of polymers
- Chemical transformations of polymers. - Polymer chain flexibility
- Dissolution and swelling.
- Degree and kinetics of swelling.
- Determination of molecular size
Molecular weight and shape in solution Molecular mass distribution of polymers.
- Distribution curves.
- Thermodynamics of polymer solution.

<table>
<thead>
<tr>
<th>5. Teaching and learning methods</th>
<th>4.1. Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.2. Contact hours</td>
</tr>
<tr>
<td></td>
<td>4.3. Problem-Based Learning</td>
</tr>
<tr>
<td></td>
<td>4.4. Encourage students to use online and library resources</td>
</tr>
</tbody>
</table>

| 6. teaching and learning methods for students with special needs | ------- |

<table>
<thead>
<tr>
<th>7. Student Assessment</th>
<th>1 Practical Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Final-Term Examination</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>a) Procedures used:</th>
<th>-------</th>
</tr>
</thead>
</table>

| b) Schedule: | Assessment 1 Practical Examination Week 12 |
## Assessment 1 Final-Term Examination Week16

<table>
<thead>
<tr>
<th>c) Weighing of Assessment:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Term Examination:</td>
<td>10</td>
</tr>
<tr>
<td>Final-Term Examination:</td>
<td>150</td>
</tr>
<tr>
<td>Practical Examination:</td>
<td>80</td>
</tr>
<tr>
<td>Semester Work:</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>250</strong></td>
</tr>
</tbody>
</table>

### 8. List of Textbooks and References:

- *Physical chemistry of polymers, David Sobolev and Nicholas Bobrov, 2nd edition (1978).*
- *Contemporary polymer chemistry, Harry R. Allcock, and Frederick W. Lampe (1981).*

#### a) Course Notes

Lecture notes of physical chemistry for 4th year students - faculty of science – Damanhour - Alexandria University.

#### b) Required Books (Textbooks)

------------

#### c) Recommended Books

- ORGANIC and PHYSICALCHEMISTRY OF POLYMERS, Yves Gnanou Michel Fontanille, (2008)

#### d) Periodicals, web sites, etc

- www.openlearn.com
- www.wikkipedia.com
- http://www.pslc.ws/mactest/glass.htm
  mers.htm
- http://chem.chem.rochester.edu/~chem421/index.htm

---

**Course Instructor:** Dr. Medhat A. Shaker  
**Head of Department:** Dr. Medhat A. Shaker  
**Date:** -----/-----/----