



University of Petra		
Faculty of Art & Science		كلية الآداب والعلوم
Department of Chemistry		قسم الكيمياء

Course Syllabus

Year : 20192

Semester: Second

Course No.	Course Title	Prerequisite	Co-requisite	Credit Hours Lectures / ECTS: European Credit Transfer System
101425	Chemistry of Surfaces and Colloids	101322	None	3/5

Instructor Name	e-mail	Office No.	Office ext.	Office Hours
Dr. Rami Abdel-Rahem	rabelrahem@uop.edu.jo	6500	6500	Sun, Tue: 13-14 Thu: 9-10 Mon, Wend: 11-12:30

Coordinator's Name: (if applicable)	
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Course Description	<p>The course will cover the following contents: An introduction to chemistry of surfaces and colloids, the structure of surface and adsorbed layers, liquid films on surface, solid-liquid interface, instruments used in chemistry of surfaces and colloids, viscosity, surface tension, capillarity, and light scattering, Tyndall effect, the electrical double layer, colloidal systems, hydrophobic and hydrophilic colloidal solutions, preparation of colloidal solution, application of colloids, protection of colloidal particle and sensitivity enhancement, protective action mechanism, stability of colloidal systems, DLVO theory, characterization of colloidal systems (Microscopy, FF-TEM, Cryo-TEM, SANS, AFM), rheology of colloids, coagulation phenomenon, coagulation kinetics, electric properties of colloidal systems, Zeta potential, gels, structure of surface active agents, , critical micelle concentration, emulsion, microemulsion, application of emulsions, phase diagrams of colloidal aggregate, colloidal ternary phase diagram</p>
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Course Objectives

- To provide students with new knowledge about chemistry of surfaces and colloids and their novel properties and applications.
- To characterize the surface and interfaces as well as colloidal aggregates using different tools.

- To prepare different types of colloidal solutions.
- To illustrate the theories, explaining the stability and coagulation of colloidal aggregates.
- To have an idea about rheology of colloids.
- To define surface active agents and their types.
- To distinguish types of emulsion and their physical properties.
- To illustrate the phase diagrams and ternary phase diagram of colloids.
- To provide students with theoretical and practical aspects related to surfactants and colloid so they can predict their properties and use them in their future industrial and research carrier.

Course Intended Learning Outcomes (ILOs) and their Alignment with Program ILOs:

Upon successful completion of this course, students are expected to achieve the following learning outcomes:

Successful completion of this module should lead to the following learning outcomes:

A - Knowledge and Understanding

This course will ensure that students become conversant with the following main aspects of colloidal and surface science:

1. Define the theories of electrical double layer.
2. Mention the properties of hydrophilic and hydrophobic colloidal solutions.
3. Define the properties of colloidal systems
4. Explain the idea of surface and collidal characterization tools.
5. Explain the phase diagram of colloids.
6. Classify the types of emulsion and their physical properties.

B- Intellectual Skills – with ability to:

1. Illustrate the behavior of adsorbant molecules at air/water and solid/water interfaces.
2. Predict the suitable tool of characterization to be used for particular surface and colloidal system.
3. Control the rheological behavior of colloidal solutions.
4. Optimize conditions required for collidal stability and coagulations.
5. Illustrate the binary and ternary colloidal phase diagrams.

C- Subject Specific Skills

1. Have special topics related to industrial applications of surface and colloids.
2. Update the knowledge about the last developments in the field of surface and colloids.

D- Transferable Skills

1. Communication skills, covering both written and oral communication with regard to the subject of study.

Course Schedule:

Week	Topics	Topic Details	Reference
1	An introduction	An introduction to chemistry of surfaces and colloids.	1
2	The structure of surface and adsorbed layers	The structure of surface and adsorbed layers, liquid films on surface, solid-liquid interface,	1
3	Instruments used in chemistry of surfaces and colloids	Instruments used in chemistry of surfaces and colloids.	1
4	Physical properties of surfaces	Viscosity, surface tension, capillarity, and light scattering, Tyndall effect.	1
5	The electrical double layer and colloidal systems.	The electrical double layer, colloidal systems, hydrophobic and hydrophilic colloidal solutions	1
6		First Exam:	
7	Preparation of colloidal solution	Preparation of colloidal solution, applications of colloids, protection of colloidal particle and sensitivity enhancement, protective action mechanism	1
8	Stability of colloidal systems	stability of colloidal systems, DLVO theory,	2
9	Characterization of colloidal systems	characterization of colloidal systems (Microscopy, FF-TEM, Cryo-TEM, SANS, AFM)	(Reference 2)
10	Rheology of colloids	rheology of colloids,	2
11	Coagulation phenomenon	coagulation phenomenon, coagulation kinetics	2
12		Second Exam:	
13	Electric properties of colloidal systems	electric properties of colloidal systems, Zeta potential	2
14	Gels, surfactants and emulsion	gels, structure of surface active agents, , critical micelle concentration, emulsion	2
15	Emulsion	Emulsion, microemulsion, application of emulsions,	2
16	phase diagrams	phase diagrams of colloidal aggregate, colloidal ternary phase diagram	2

Assessment Methods:

Assessment method	Grade	Comments
First Exam	25	
Second Exam	25	
Participation	10	
Final Exam	40	

Total	100	
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Alignment of Teaching and Learning Methods, Assessment and Course ILOs:

Teaching method	Contact Hours	Assessed through	ILOs numbers
Lectures	3 hrs / week	Reports, discusion, exams and homework	A(1),A(2),A(3), A(4), A(5),A(6),B(1), B(2),B(3),B(4),B(5),C(1),C(2),D(1), and D(2)

Learning References:

1- Textbook (s):
<ol style="list-style-type: none"> Laidler and Meiser, Physical Chemistry, Duncan J Shaw, Introduction to Colloids and Surface Chemistry, 4 edition, reprinted in 2003
2- References:
<ol style="list-style-type: none"> Richard M Pashley and Marily E Karaman, Applied Colloid and Surface Chemistry, 2004 R. Abdel-Rahem, M. Gradzielski, and H. Hoffmann(A Novel Viscoelastic System from a Cationic Surfactant and a Hydrophobic Counterion) Journal of colloid and interfacial science, 288, 2 , (2005), 570-582.
3- Other Resources:
<< a lecture rooms with data show facility>>

Course Policies¹

- Attendance Policy:** University regulations apply to attendance.
- Academic Honesty:** Academic dishonesty is an unacceptable mode of conduct, and will not be tolerated in any form at University of Petra. All persons involved in academic dishonesty and plagiarism in any form will be disciplined in accordance with University rules and regulations.

Approved by	Name	Date	Signature
Head of Department	Dr. Abdelmnim Altwaiq		
Faculty Dean	Prof. Rami Abdel-RAhem		

¹ Additional information may be added in this section according to the nature of the course.