مركز الاعتماد وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

Course Syllabus

1	**Course title**	Polymer Physics
2	**Course number**	0332271
3	**Credit hours**	(3, 0)
	Contact hours (theory, practical)	(48, 0)
4	**Prerequisites/corequisites**	None
5	**Program title**	BSc in Physics
6	**Program code**	03
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Physics
10	**Course level**	Second year
11	**Year of study and semester (s)**	Second, second semester
12	**Other department (s) involved in teaching the course**	None
13	**Main teaching language**	English
14	**Delivery method**	☒Face to face learning ☐Blended ☐Fully online
15	**Online platforms(s)**	☒Moodle ☐Microsoft Teams ☐Skype ☐Zoom ☐Others……
16	**Issuing/Revision Date**	9/10/2022

17 Course Coordinator:

Name: Prof. Mahmoud Al-Hussein Contact hours: Mon.: 8.30-10:00, Wed.: 8:30-10:00

Office number: 308 Phone number: Ext. 22053

Email: m.alhussein@ju.edu.jo

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18 Other instructors:

Name: Office number: Phone number: Email: Contact hours: Name: Office number: Phone number: Email: Contact hours:

19 Course Description:

As stated in the approved study plan. Overview; Molar Masses; Thermodynamics of polymer solutions; Polymer dimensions; Amorphous polymers; Crystalline polymers; Glass to rubber transition; Cross-linked polymers and rubber elasticity; Polymer viscoelasticity; Mechanical behaviour of polymers.

20 Course aims and outcomes:

A- Aims:

Develop an understanding of structure-property relationships in terms of the underlying physics and physical chemistry of polymers in melt, solution, and solid state.

B- Students Learning Outcomes (SLOs):

SLO (1): Master professionally a broad set of knowledge concerning the fundamentals in the basic areas of physics: Quantum Mechanics, Classical Mechanics, Electricity and Magnetism, Thermal Physics, Optics, Theory of Special Relativity, Mathematical Physics, Electronics.

SLO (2): Apply knowledge of mathematics and fundamental concepts in the basic areas of physics to identify and solve physics related problems.

SLO (3): Utilize computers and available software in both data collections and data analysis.

SLO (4): Utilize standard laboratory equipment, modern instrumentation, and classical techniques to design and conduct experiments as well as to analyze and interpret data.

SLO (5): Develop a recognition of the need and ability to engage in life-long learning.

SLO (6): Demonstrate ability to use techniques, skills, and modern scientific tools necessary for professional practice.

SLO (7): Communicate clearly and effectively in both written and oral forms.

SLO (8): Apply proficiently team-work skills and employ team-based learning strategies.

SLO (9): Apply professional and ethical responsibility to society.

Upon successful completion of this course, students will be able to:

SLOs / SLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)	SLO (9)
1. Learn the fundamental knowledge on the physics of polymer materials	✓	✓			✓	✓			
2. Acquire knowledge on polymer characteristics in comparison to small molecules materials	✓	✓			✓	✓			
3. Correlate polymer properties with their molecular structure	✓	✓			✓	✓			
4. Acquire knowledge on polymer phase transitions Knowledge on polymer phase transitions	✓	✓			✓	✓			
5. Acquire knowledge on how to use analysis techniques to identify the properties of polymers	✓	✓			✓	✓			
6. Acquire knowledge on the modern applications of polymers.	✓	✓			✓	✓			

21. Topic Outline and Schedule:

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Week	Lecture	Topic	Intended Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Introduction and Overview	1,2,3,6				Homeworks, Midterm Exam, Final Exam	
	1.2							
	1.3							
2	2.1	Conducting Polymers						
	2.2	Molar Masses						
	2.3	Molecular Shapes						
3	3.1	Thermodynamics of Polymer Solutions						U.W. Gedde: Polymer Physics, Chapman & Hall 1995
	3.2							
	3.3							
4	4.1							
	4.2							
	4.3							
5	5.1							
	5.2							
	5.3							
6	6.1							
	6.2							
	6.3							
7	7.1	Polymer Dimensions						M. Doi: Introduction to
	7.2							

	7.3							Polymer Physics, Oxford 1995, L.H. Sperling
8	8.1							
	8.2							
	8.3							
9	9.1	Amorphous Polymers						U.W. Gedde: Polymer Physics, Chapman & Hall 1995
	9.2							
	9.3							
10	10.1	Crystalline Polymers						G. Strobl: The Physics of Polymers, Springer, 1997 G. Strobl: The Physics of Polymers, Springer, 1997
	10.2							
	10.3							
11	11.1							
	11.2							
	11.3							
12	12.1	Glass to Rubber Transition						
	12.2							
	12.3							
13	13.1	Cross-linked Polymers and Rubber Elasticity						
	13.2							

	13.3							
14	14.1	Polymer Viscoelasticity						
	14.2							
	14.3							
15	15.1	Mechanical Behavior of Polymers						
	15.2							
	15.3							

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
First Exam	20%	Fundamentals, Conductive Polymers, Molar masses and shapes, and Polymer Solution Thermodynamics	1,2,5	5	
Midterm Exam	30%	Polymer dimensions, Amorphous Polymers, Crystalline Polymers	1-6	10	
Final Exam	50%	All topics	1-6	16	

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23 Course Requirements

(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):
Textbook, computer, and internet access

24 Course Policies:

A- Attendance policies:
Students are expected to attend all classes. Absence should not exceed 15%.
B- Absences from exams and submitting assignments on time:
Exam makeups will be arranged for students with valid absence excuses.
C- Health and safety procedures:
Synchronous online lecturing and Moodle or testing are meant to keep students healthy and safe.
D- Honesty policy regarding cheating, plagiarism, misbehavior:
Cheating, plagiarism, and misbehavior will be dealt with according to University regulations.
E- Grading policy:
Oral Quizzes: 10%, Written Quizzes: 10%, Midterm Exam: 30%, Final Exam: 50%.
F- Available university services that support achievement in the course:
Microsoft Teams, E-Learning platform, Moodle.

25 References:

A- Required book(s), assigned reading and audio-visuals:
U.W. Gedde: Polymer Physics, Chapman & Hall 1995
B- Recommended books, materials, and media:
G. Strobl: The Physics of Polymers, Springer, 1997
M. Doi: Introduction to Polymer Physics, Oxford 1995, L.H. Sperling
D. I. Bower: An Introduction to Polymer Physics, Cambridge University Press, 2002
F. Billmeyer: Textbook of Polymer Science, Wiley and Sons, Inc.

26 Additional information:

Name of Course Coordinator: -Prof. Mahmoud Al-Hussein -Signature: ---------- Date: -9/10/2022
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------