Jordan University of Science and Technology

Faculty of Engineering

Industrial Engineering Department

IE760 Advanced Engineering Materials. - JNQF Level: 9
Second Semester 2022-2023

Course Catalog
3 Credit Hours. This course discusses the structure, chemical, physical, mechanical properties, electrical and magentic properties with manufacturing considerations for various materials including: metallic materials, ceramics, polymers, and composite materials. It also gives an introduction to nanomaterial the small size effect concept. The course gives an introduction about various modern material characterization techniques, i.e., scanning electron micrsocope, energy dispersive spectroscopy, x-ray diffraction,..etc
Teaching Method: Blended

Text Book	
Title	Materials Science and Engineering : an Introduction
Author(s)	David G. Rethwisch, William D. Callister Jr.
Edition	10th Edition
Short Name	Ref # 1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref # 2	Understanding Solids: The Science of Materials	Richard J. D. Tilley	3rd Edition	
Ref # 3	Nanomaterials: An overview of synthesis, classification,characterization, and applications	Bawoke Mekuye, Birhanu Abera	1st Edition	https://doi.org/10.1002/nano.202300038
Ref # 4	Materials Characterizations Fundementals	Franklin & Marchall College	1st Edition	Open Education Resource (OER) LibreTexts Project (https://LibreTexts.org)

Instructor

Name	**Prof. Mohammed Almomani**
Office Location	M5L3 Tel 22539
Office Hours	
Email	maalmomani7@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Sun : 14:30 - 16:30 Room: M5124

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Weeks 1, 2	Structure and Properties of Ceramics	**Ch 12** From **Ref # 1**
Weeks 2, 3	Polymer Structure and Properties	**Ch 14** From **Ref # 1**
Weeks 3, 4	Composites	**Ch 16** From **Ref # 1**
Week 6	Introduction to Nanomaterials	From **Ref # 3**
Weeks 6, 7	Influence of Size Reduction on the Properties of Nanomaterials	From **Ref # 3**
Week 5	Midterm Exam	
Week 8	Magnetic Properties of Solids	**Ch 12** From **Ref # 2**
Week 9	Scanning Electron Microscope (SEM)	From **Ref # 4**
Week 10	Energy Dispersive Spectroscopy (EDS)	From **Ref # 4**
Week 11	X- ray Diffraction Technique (Xrd)	From **Ref # 4**
Weeks 12, 13	Term Project Presentation (MultiCriteria Decision Methods for Materials Selection)	
Weeks 13, 14	Material Characterization Presentation	

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	**Course Outcome Weight (Out of 100%)**	**Assessment method**
Analyze the structure, chemical composition, and physical properties of metallic materials, ceramics, polymers, and composite materials, integrating manufacturing considerations. [1SLO1] [1L9K1]	40%	First Exam, Final Exam

Utilize decision-making methods to assess the various properties of advanced engineering materials, determining their suitability for specific engineering applications through comprehensive evaluation. [1SLO2, 1SLO7] [1L9K2, 1L9S2]	20%	Materials Selection Project
Apply the principles of nanomaterials and understand the concept of size effects in engineering materials, predicting their behavior at the nanoscale. [1SLO1] [1L9K1]	20%	Nanomaterials Assignment, Final Exam
Compare and contrast various modern material characterization techniques, including scanning electron microscopy, energy dispersive spectroscopy, and X-ray diffraction, to determine their applicability and limitations in materials analysis [1SLO6] [1L9K1]	20%	Research Paper Analysis, Materials Characterizations Presentations, Final Exam

Relationship to Program Student Outcomes (Out of 100%)						
SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7
60	10				20	10

Relationship to NQF Outcomes (Out of 100%)		
L9K1	L9K2	L9S2
80	10	10

Evaluation	
Assessment Tool	**Weight**
First Exam	20%
Materials Selection Project	20%
Nanomaterials Assignment	3%
Research Paper Analysis	3%
Materials Characterizations Presentations	4%
Final Exam	50%

Policy	
Students Conduct	It is the responsibility of each student to adhere to the principles of academic integrity. Academic integrity means that a student is honest with him/herself, fellow students, instructors, and the University in matters concerning his or her educational endeavors. Cheating will not be tolerated in this course. University regulations will be pursued and enforced on any cheating student.
Teaching and Learning Methods	1. Active learning, where students should be active and involved in the learning process inside the classroom. 2. The teaching method that will be used in this course will be composed of a series of lectures interrupted with frequent brainstorming questions and discussions within this scope of the lecture.

Project Presentations Format	1. Each student will be allocated a specific time slot for their presentation, typically ranging from 15 to 20 minutes, depending on the class size and the number of presentations scheduled. 2. Presentations should include an introduction to the research topic, a clear statement of objectives, a summary of methods employed, key findings, and conclusions. 3. Visual aids such as slides or posters are encouraged to enhance the clarity and effectiveness of the presentation.
Project Evaluation Criteria	1. Content: Clarity and depth of the research topic, relevance of the objectives, soundness of methodology, and significance of findings. 2. Organization: Logical flow of presentation, coherence of ideas, and effective use of visual aids. 3. Delivery: Confidence, clarity of speech, engagement with the audience, and adherence to the allocated time. 5. Following each presentation, there will be a brief period for questions and feedback from both the instructor and fellow students. 6. The instructor will provide constructive feedback on the content, organization, delivery, and overall effectiveness of the presentation.
Project Deadline and Rescheduling	Students must adhere to the scheduled presentation dates unless there are extenuating circumstances, in which case they must notify the instructor well in advance to discuss possible rescheduling options.
Project Professionalism and Etiquette	1. Students are expected to conduct themselves professionally during presentations, demonstrating respect for both presenters and audience members. 2. Disruptive behavior will not be tolerated and may result in disciplinary action.

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