Jordan University of Science and Technology

Faculty of Engineering

Aeronautical Engineering Department

AE332 Aircraft Structural Materials - JNQF Level: 7
First Semester 2023-2024

Course Catalog
3 Credit Hours. This course focuses on the fundamentals of materials, including, structural materials in the aircraft industry, crystalline structures of materials, imperfections in materials, diffusion in solids, mechanical behavior and mechanical properties, strengthening mechanisms, mechanical failure, phase diagrams, phase transformations, types and applications of metal alloys, and an introduction to composite materials. This course provides students with a robust foundation in material science, emphasizing its application to the specific challenges and requirements of the aircraft industry.

Text Book	
Title	Materials Science and Engineering
Author(s)	W. D. Callister
Edition	9th Edition
Short Name	Textbook
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref #1	Introduction to Engineering Materials	V. B. John	3rd Edition	
Ref #2	Engineering Materials: An Introduction to Properties, Applications and Design	D.R.H Jones and Michael F. Ashby	4th Edition	

Instructor	
Name	**Dr. ABDALLAH ALMOMANI**
Office Location	N1- L2

Office Hours	Sun : 08:30 - 09:30 Sun : 10:30 - 11:30 Mon : 11:30 - 13:00 Tue : 08:30 - 09:30 Tue : 10:30 - 11:30 Wed : 11:30 - 13:00 Thu : 08:30 - 09:30
Email	amalmomani0@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Mon, Wed : 10:00 - 11:30 Room: M2011

Prerequisites		
Line Number	**Course Name**	**Prerequisite Type**
712140	AE214 Strength Of Materials	Prerequisite / Pass

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	Introduction to Material Science and Engineering	**Chapter 1** From **Textbook**
Weeks 2, 3	The Structure of Crystalline Solids	**Chapter 3** From **Textbook**
Week 4	Imperfections in Solids	**Chapter 4** From **Textbook**
Week 5	Diffusion in materials (Solid Solution)	**Chapter 5** From **Textbook**
Weeks 6, 7	Mechanical Properties of Metals	**Chapter 6** From **Textbook**
Weeks 8, 9	Dislocations and Strengthening Mechanisms	**Chapter 7** From **Textbook**
Weeks 10, 11	Failure	**Chapter 8** From **Textbook**
Weeks 12, 13	Phase Diagrams and Phase Transformation	**Chapter 9 and Chapter 10** From **Textbook**
Weeks 14, 15	Application and processing of metal and alloys	**Chapter 11** From **Textbook**
Weeks 15, 16	Introduction to composite materials	**Chapter 16** From **Textbook**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Explain atomic bonding and crystal structures, utilizing analytical skills to examine various types of atomic bonding and comprehend the crystalline structure of engineering materials to gain insights critical for material processing and predicting material behavior. [1SO1] [1L7K1]	25%	

Classify imperfections in crystalline solids and execute mathematical diffusion calculations to grasp the concept of diffusion in the context of materials processing. [1SO2] [1L7S1]	10%	
Identify the mechanical behavior of engineering materials, categorize the strengthening mechanisms, and show their connection to dislocations, contributing to a comprehensive understanding of material durability and mechanical failure. [1SO1] [1L7K1]	15%	
Recall principles related to mechanical failure in aircraft materials, outlining preventive measures, and proposing solutions for different operational conditions. [1SO4] [1L7C2]	15%	
Demonstrate the ability to explain phase diagrams, with a specific focus on the iron-carbon phase diagram, and describe phase transformations, elucidating their relationship to the phase diagram. [1SO2] [1L7S1]	25%	
Apply the acquired knowledge to implement material applications and processing methods for metal alloys, recognizing the influence of processing conditions on material properties. Integrate knowledge of composite materials for a comprehensive understanding of materials engineering. [1SO4] [1L7C2]	10%	

Relationship to Program Student Outcomes (Out of 100%)						
SO1	SO2	SO3	SO4	SO5	SO6	SO7
40	35		25			

Relationship to NQF Outcomes (Out of 100%)		
L7K1	L7S1	L7C2
40	35	25

Evaluation	
Assessment Tool	**Weight**
First Exam	25%
Second Exam	25%
Homeworks and Quizzes	10%
Final Exam	40%

Policy	
Attendance	The student is required to attend all the registered courses. The instructor shall register student attendance or absence electronically. JUST policy requires the faculty member to assign ZERO grade (35) if a student misses 20% of the classes. If you miss a class, it is your responsibility to find out about any announcements or assignments you may have missed.

Exam/Homework	Makeup exam should not be given unless there is a valid excuse according to JUST policies. Arrangements to take an exam at a time other than the one scheduled MUST be made prior to the scheduled exam time. Cheating or copying from neighbor on exam, quiz, or homework is an illegal and unethical activity. Standard JUST policy will be applied. All assignments must be your own work (your own words) Students are responsible for all information provided in lecture. Information presented in class supersedes any information posted elsewhere.

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