Philadelphia University

Faculty of Engineering and Technology
Department of Mechanical Engineering

Course Information

Course Title: Materials Science (620274)

Prerequisite: Strength of Materials (620213)

Credit Hours: 3 credit hours (16 weeks per semester, approximately 44 contact hours)

Textbook: Materials science and engineering -7 th edition by William D. Callister Jr.

References: - Materials science and metallurgy, 3rd edition, Herman W. Pollack.
- Material science and metallurgy, 1st.edition, O. P. Khanna

Course Description

Gain a fundamental understanding of materials, its structures on different levels (from crystal cell to macrostructure), phase transformations and how it influences its mechanical, electrical, optical and magnetic properties from common science perspective.

This course will introduce you to the various properties and structures of materials and lay a strong foundation for your further study of engineering and its related disciplines. Material failure, Mechanical properties, heat treatment process.

Course requirements: Computer, internet connection,

Instructor: Dr.Hasan Al Dabbas

Office: Mechanical Engineering building, room E61209, ext.: 2134

Week	Topic
1. 2	Fundamentals of Materials: • Definitions • Introduction • Material system elements • Classification of materials, The Structure of Crystalline Solids.
3	• Atomic structure and interatomic bonding
4,5,6,	• imperfections in Solid • Types of Imperfections • Crystalline Defects • Dislocations • Polycrystalline Materials • Microscopic Examination • Diffusion in Solids • Processing Using Diffusion
7,8,9	Mechanical Properties: • Plastic properties of materials • Hardness • Hardness: Measurement • Dislocations & Strengthening Mechanisms • Cold Work (%CW) • Annealing
11,12	Mechanical Failure: • Failure mechanisms • Fracture, Fatigue, Creep, Corrosion, Buckling, Melting, Thermal shock, Wear • . Environmental effects
13,14,	Phase Diagrams: • Definitions • Microstructures • Alloying Steel
15,16	• Metal Alloys • Applications and Processing • Ferrous Alloys • Nonferrous Alloys • Metal Fabrication Methods • Thermal Processing of Metals • Review • Final Examination

ABET Student Outcomes (SOs) .

1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should be able to:

1.	Classify the type of materials and the Structure of Crystalline Solids	[1 , 2]
2.	Understand the concept of Atomic structure and interatomic bonding and the concept of imperfections in Solid and how to obtain it for a given simple system.	[1 , 2]
3	Construct and implement the type of Imperfections in industry how to inspect the Crystalline Defects.	[1 , 3]
4.	Ability to find and recognize the mechanical properties of materials and alloys.	[1, 7]

Teaching methodology: Online, Blended or both

Electronic platform: Microsoft-teams

Evaluation methods:

Evaluation of student's performance (final grade) will be based on the following categories:

Mid-term exam: Shall be given at the end of the seventh week of the course in the form of multiple choice questions and (or) specific problems to be solved and uploaded by the student using the University electronic platform.

Quizzes: A number of 10-minute quizzes in the form of multiple choice questions or an assignment using the University electronic platform. Will be given to the students during the semester. These quizzes will cover material discussed during the previous lecture(s).

Homework: Problem sets will be given to students in the form of assignments using the University Electronic platform. Homework should be solved by each student individually and submitted using the platform before the due date.

Copying homework is forbidden, any student caught copying the homework or any part of the homework will receive zero mark for that homework

Participation: Questions will be asked during the online session (lecture) and the student is assessed based on his/her response

Final Exam: The final exam will cover all the class material.

Grading policy:

Mid-term Exam.	30%
Home works, Quizzes and participation	30%
Final Exam	40%
Total:	100%

Attendance policy:

Absence from classes and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse, acceptable to and approved by the Dean of the relevant college/faculty, shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.