



BIOPHYSICS – (0302110)



PHYSICS DEPARTMENT

SPRING SEMESTER (2025 / 2026)

Recommended Textbook:

"THE SCIENCE AND ENGINEERING OF MATERIALS"

Donlad R. Askeland and Wendelin J. Wright, **7th edition**, (Enhanced, Si Edition).

Other References:

W. Callister and David G. Rethwisch "Materials Science and Engineering - SI Version" 9th edition.

Instructor: Dr. Riad Shaltaf

email: r.shaltaf@ju.edu.jo

Tentative Course Content:

Ch.	Content
1	Introduction to Materials Science 1-1 What is Materials Science and Engineering 1-2 Classification of Materials 1-3 Functional Classification of Materials 1-4 Classification of Materials Based on Structure 1-5 Environmental and Other Effects 1-6 Materials Design and Selection
2	Atomic Structure 2-1 The Structure of Materials: 2-2 The Structure of the Atom 2-3 The Electronic Structure of the Atom 2-4 The Periodic Table 2-5 Atomic Bonding 2-6 Binding Energy and Interatomic Spacing 2-7 The Many Forms of Carbon:
3	Atomic and Ionic Arrangements 3-1 Short- vs. Long-Range Order 3-2 Amorphous Materials 3-3 Lattice, Basis, Unit Cells & Crystal Structures 3-4 Allotropic or Polymorphic Transformations 3-5 Points, Directions & Planes in the Unit Cell – (Hexagonal Unit Cells self-reading) 3-6 Interstitial Sites 3-7 Crystal Structures of Ionic Materials 3-8 Covalent Structures 3-9 Diffraction Techniques for Crystal Structure Analysis (self-reading)
4	Imperfections in the Atomic and Ionic Arrangement 4-1 Point Defects 4-2 Other Point Defects
5	Atom and Ion Movements in Materials 5-1 Applications of Diffusion 5-2 Stability of Atoms & Ions 5-3 Mechanisms for Diffusion 5-4 Activation Energy for Diffusion 5-5 Rate of Diffusion (Fick's 1st Law) 5-6 Factors Affecting Diffusion 5-9 Diffusion & Materials Processing

6	Mechanical Properties: Part I 6-1 Technological Significance 6-2 Terminology for Mechanical Properties 6-3 The Tensile Test: Use of Stress Strain Diagram 6-4 Properties Obtained from the Tensile Test 6-5 True Stress & True Strain 6-7 Hardness of Materials
15	Ceramics 15-1 Bonding in Ceramics 15-2 Structures of Crystalline Ceramics 15-3 Defects in Crystalline Ceramics 15-8 Glass-Ceramics 15-11 Other Ceramic Materials
16	Polymers 16-1 Classification of Polymers 16-2 Addition & Condensation Polymerization 16-3 Degree of Polymerization 16-10 Adhesives
21	Photonic Materials 21-1 The Electromagnetic Spectrum 21-2 Refraction, Reflection, Absorption & Transmission 21-3 Selective Absorption, Transmission, or Reflection
22	Thermal Properties of Materials 22-1 Heat Capacity & Specific Heat 22-2 Thermal Expansion 22-3 Thermal Conductivity 22-4 Thermal Shock

Exams	Weight %	Date	# of Questions	Chapters Included
Midterm Exam	25	TBA	TBA	TBD
Exam	25	TBA	TBA	<u>TBD</u>
Final	50	TBA	TBA	TBD

Note: All exams are multiple choice.