**University of Management and Technology**

**School of Science and Technology**

***Department of Physics***

**Course Code:** **PH 7250**

**Course Title: Material Science**

**Program: MS/PhD (Phy)**

**Course Outline**

**Course Objectives**

To understand the classification of materials based on the structure and the properties of the materials and also understand the concepts of atomic bonding, crystal structures, imperfections, diffusion, mechanical properties, electron energy, and dislocations as related to processing and performance of engineering materials. Understand the relationship between the structure and the properties of the existing materials and learn about the modification of properties of the materials by controlling the synthesis process. Understand the microstructure characteristics, electronic properties, materials formation, and manipulation of microstructure for application in engineering design and materials processing.

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| **Schedule** | Wednesday(18:30-21:30) | **Pre-requisite** | Mechanics, Electricity and Magnetism, Modern Physics | |
| **Course Coordinator** | Dr. Tanvir Hussain | **Contact** | tanvir.hussain@umt.edu.pk | |
| **Text**  **Book** | Material Science and Engineering-An Introduction 9th edition by William D. Callister and David G. Rethwisch | | | |
| **Reference Book:** | 1. Solid State Physics by Ashcroft and Mermin. 2. Introduction to Solid State Physics by Kittle ( 8th Edition) | | | |
| **Assignments** | Problems will be assigned at regular intervals as an assignment. | **Quizzes** | | All quizzes will be announced well before time.  No make-ups will be offered for missed quizzes. |
| **Mid Term**  **Examination** | A 60-minutes exam will cover all the material covered during the first  7 lectures.  Combined Mid Term exam for all multiple sections. | **Final**  **Examination** | | A 120-minutes exam will cover all the material covered during the semester.  Combined Final exam for all multiple sections |
| **Attendance**  **Policy** | Students missing more than 25% of the lectures will receive an “SA” grade in the course and will not be allowed to take Final exam. | | | |

**Department of Physics**

**Material Science**

**Lecture Plan**

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| **Week** | **Lecture**  **#** | **TOPICS** | **CH** | **SECTIONS** |
| 1 | 1 | Introduction of Material science | 1 |  |
| 2 | 1 | Atomic Structure and Interatomic bonding | 2 |  |
| 3 | 1 | The Structure of the crystalline Solids | 3 |  |
| 4 | 1 | Imperfections in Solids | 4 |  |
| 5 | 1 | Diffusion | 5 |  |
| 6 | 1 | Mechanical Properties of the materials | 6 |  |
| 7 | 1 | Failure | 8 |  |
| 8 | 1 | Phase diagram | 9 |  |
| 9 | 1 | Structure and properties of the Ceramics | 12 |  |
| 10 | 1 | Polymer structure | 14 |  |
| 11 | 1 | Composites | 16 |  |
| 12 | 1 | Electrical Properties | 18 |  |
| 13 | 1 | Thermal Properties | 19 |  |
| 14 | 1 | Magnetic Properties | 20 |  |
| 15 | 1 | Optical Properties | 21 |  |

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