

**GOVERNMENT POLYTECHNIC JAJPUR**

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**DEPARTMENT OF METALLURGICAL ENGG.**

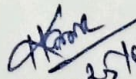
|                                   |                                                  |                                                                                                     |
|-----------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>Discipline:<br/>Metallurgy</b> | <b>Semester: 3rd</b>                             | <b>Name of the Teaching faculty: Rakesh Kumar Sahu</b>                                              |
| <b>Subject:<br/>TH1- IME</b>      | <b>No of<br/>Days/Week<br/>class allotted: 3</b> | <b>Semester from Date: 01/07/26 To Date: 05/11/26<br/>No of weeks: 15</b>                           |
| <b>Week</b>                       | <b>Class Day</b>                                 | <b>Topics</b>                                                                                       |
| 1st                               | 1 <sup>st</sup>                                  | <b>Unit-1</b> : Introduction to Metallurgy & Material Engineering                                   |
|                                   | 2 <sup>nd</sup>                                  | Historical Perspective of Material Science                                                          |
|                                   | 3 <sup>rd</sup>                                  | Scope of Material Engineering                                                                       |
| 2nd                               | 1 <sup>st</sup>                                  | Processing/structure/Properties/Performanance Correlations                                          |
|                                   | 2 <sup>nd</sup>                                  | Atomic Structure- Fundamental Concept of atoms                                                      |
|                                   | 3 <sup>rd</sup>                                  | Bonding Forces and Energies                                                                         |
| 3rd                               | 1 <sup>st</sup>                                  | Interatomic bonds - Covalent bond, Ionic bond                                                       |
|                                   | 2 <sup>nd</sup>                                  | Metallic bond, Hydrogen bond and Vander waals bond                                                  |
|                                   | 3 <sup>rd</sup>                                  | Doubt clearing class of Unit-1, Numerical practice                                                  |
| 4th                               | 1 <sup>st</sup>                                  | <b>Unit-2</b> : Structure of Crystalline Solids                                                     |
|                                   | 2 <sup>nd</sup>                                  | Crystal and crystallography                                                                         |
|                                   | 3 <sup>rd</sup>                                  | Unit cells, Bravais lattices, 7 Crystal system                                                      |
| 5th                               | 1 <sup>st</sup>                                  | Crystal structure - SC, BCC,FCC, HCP                                                                |
|                                   | 2 <sup>nd</sup>                                  | Miller Indices, Crystallographic Directions, Crystallographic Planes                                |
|                                   | 3 <sup>rd</sup>                                  | Linear and Planar Densities calculation                                                             |
| 6th                               | 1 <sup>st</sup>                                  | Co-ordination number, Calculation of APF and Density                                                |
|                                   | 2 <sup>nd</sup>                                  | Imperfections in Solids - Point defects - Vacancies and Self-Interstitials                          |
|                                   | 3 <sup>rd</sup>                                  | Dislocations— Edge & Screw, Burger Vector                                                           |
| 7th                               | 1 <sup>st</sup>                                  | Interfacial Defects , Bulk or Volume Defects                                                        |
|                                   | 2 <sup>nd</sup>                                  | Remedial Class on unit-2, Important Q & A discussion                                                |
|                                   | 3 <sup>rd</sup>                                  | <b>Class Test- 1</b>                                                                                |
| 8th                               | 1 <sup>st</sup>                                  | <b>Unit-3</b> : Mechanical Properties - Basic concepts on stress and strain                         |
|                                   | 2 <sup>nd</sup>                                  | Deformation and its types, Hooke's Law                                                              |
|                                   | 3 <sup>rd</sup>                                  | Electronic and Ionic Conduction                                                                     |
| 9th                               | 1 <sup>st</sup>                                  | Energy Band Structures in Solids                                                                    |
|                                   | 2 <sup>nd</sup>                                  | Electrical Characteristics of Commercial Alloys , Materials of Importance—Aluminum Electrical Wires |

|      |                 |                                                                                                                  |
|------|-----------------|------------------------------------------------------------------------------------------------------------------|
|      | 3 <sup>rd</sup> | Semiconductivity (intrinsic Semi-conduction and Extrinsic Semi-conduction), Factors that Affect Carrier Mobility |
| 10th | 1 <sup>st</sup> | Piezo-electricity and its applications                                                                           |
|      | 2 <sup>nd</sup> | Magnetic Properties - Diamagnetism, Para-magnetism                                                               |
|      | 3 <sup>rd</sup> | Ferromagnetism, Anti-ferromagnetism and Ferrimagnetism                                                           |
| 11th | 1 <sup>st</sup> | Superconductivity                                                                                                |
|      | 2 <sup>nd</sup> | Optical Properties                                                                                               |
|      | 3 <sup>rd</sup> | Electromagnetic Radiation -Light Interactions with Solids , Atomic and Electronic Interactions                   |
| 12th | 1 <sup>st</sup> | Refraction, Reflection, Absorption and Transmission                                                              |
|      | 2 <sup>nd</sup> | Applications of optical phenomena -Luminescence, Photoconductivity, Light-Emitting Diodes                        |
|      | 3 <sup>rd</sup> | Lasers and Optical Fibers in Communications                                                                      |
| 13th | 1 <sup>st</sup> | Doubt Clearing Class of Unit-3 & Numerical practices                                                             |
|      | 2 <sup>nd</sup> | <b>Class Test -2</b>                                                                                             |
|      | 3 <sup>rd</sup> | <b>Unit-4 : Engineering Materials - Fundamentals of Engineering Materials</b>                                    |
| 14th | 1 <sup>st</sup> | Classification of Engineering Material- Metal, Polymer, Ceramic                                                  |
|      | 2 <sup>nd</sup> | Composite and Electronic material, Material Selection                                                            |
|      | 3 <sup>rd</sup> | Doubt Clearing Class of All Units, Important Q & A discussion                                                    |
| 15th | 1 <sup>st</sup> | Previous years Semester question & answer discussion                                                             |
|      | 2 <sup>nd</sup> | <b>Very Similar Test(VST)-1</b> to Semester questions                                                            |
|      | 3 <sup>rd</sup> | <b>Very Similar Test(VST)-2</b> to Semester questions                                                            |

**Course Outcomes(COs):** After completing this course, the student should be able to:

1. Understand material structure: Understanding how the atoms of a material are arranged.
2. Understand Crystal defects To know the crystal defects, present in material and differentiate them.
3. Understand material properties: Understanding the properties of materials, such as strength, conductivity, and density.
4. Knowledge of Engineering Materials To know various types of engineering materials and their application.

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 Dt - 25/6/26  
 Course Co-ordinator  
 Metallurgical Engg.

  
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