**B I T POLYTECHNIC, BALASORE**

**3rd SEMESTER MECHANICAL ENGINEERING (2025-26)**

**SUBJECT- MATERIAL SCIENCE & ENGINEERING** **TOTAL PERIODS-60**

**THEORY-4P/WEEK**

**NAME OF FACULTY : MRUTYUNJAYA ROUT (Mechanical Engg.)** **Semester from: 11/07/2025 to 15/11/2025**

| Sl No. | week | Day | Topics to be covered |
|---|---|---|---|
| 1 | 1st | 1st day | Material classification into ferrous and non-ferrous category and alloys |
| | | 2nd day | Properties of Materials: Physical and Chemical Mechanical |
| | | 3rd day | Properties of Materials: Mechanical and Thermal properties |
| | | 4th day | Material reliability and safety |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 2 | 2nd | 1st day | Characteristics and application of ferrous materials |
| | | 2nd day | Classification, composition and application of low carbon steel, |
| | | 3rd day | Classification, composition and application of medium carbon steel and High carbon steel |
| | | 4th day | Alloy steel: Low alloy steel and high alloy steel |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 3 | 3rd | 1st day | Types of tool steel and stainless steel:-Classification, Properties and uses |
| | | 2nd day | Tool steel: Effect of various alloying elements such as Cr, Mn, Ni, V, Mo, |
| | | 3rd day | Introduction to Iron – Carbon system |
| | | 4th day | Concept of phase diagram |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 4 | 4th | 1st day | Concept of Cooling curves |
| | | 2nd day | Features of Iron-Carbon diagram with salient micro-constituents of Iron and Steel |
| | | 3rd day | Iron-Carbon diagram |
| | | 4th day | Crystal defines and classification of crystals |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 5 | 5th | 1st day | Ideal crystal definition |
| | | 2nd day | Classification of imperfection: Point defects and Line defects |
| | | 3rd day | Types of surface defects and volume defects |
| | | 4th day | Types and causes of point defects: Vacancies, Interstitials and impurities |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 6 | 6th | 1st day | Types and causes of line defects: Edge dislocation and screw dislocation |
| | | 2nd day | Effect of imperfection on material properties |

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| | | 3rd day | Deformation by slip and twinning |
| | | 4th day | Effect of deformation on material properties |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 7 | 7th | 1st day | Introduction to Heat Treatment |
| | | 2nd day | Purpose of Heat treatment |
| | | 3rd day | Process of heat treatment: Annealing, Normalizing and Hardening |
| | | 4th day | Tempering and stress relieving measures |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 8 | 8th | 1st day | Surface hardening: Carburizing and Nitriding process |
| | | 2nd day | Effect of heat treatment on properties of steel |
| | | 3rd day | Hardenability of steel |
| | | 4th day | Revision and Discussions with doubt clearance |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 9 | 9th | 1st day | Introduction to Non-ferrous alloys |
| | | 2nd day | Aluminum alloys: Composition, property and usage of Duralmin, y- alloy |
| | | 3rd day | Copper alloys: Composition, property and usage of CopperAluminum, Copper-Tin, Babbit alloys |
| | | 4th day | Copper alloys: Composition, property and usage of Phosperous bronze, brass, Copper- Nickel alloys |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 10 | 10th | 1st day | Predominating elements of lead alloys, Zinc alloys and Nickel alloys |
| | | 2nd day | Low alloy materials like P-91, P-22 for power plants |
| | | 3rd day | High alloy materials like stainless steel grades of duplex, super duplex materials |
| | | 4th day | Introduction to Bearing Material |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 11 | 11th | 1st day | Classification, composition, properties and uses of Copper base bearing materials |
| | | 2nd day | Classification, composition, properties and uses of Tin Base and Lead base, bearing materials |

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| | | 3rd day | Classification, composition, properties and uses of Cadmium base bearing materials |
| | | 4th day | Doubt clearance |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 12 | 12th | 1st day | Introduction to Spring materials |
| | | 2nd day | Classification, composition, properties and uses of Ironbase Spring materials |
| | | 3rd day | Classification, composition, properties and uses of copperbase Spring materials |
| | | 4th day | Doubt clearance |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 13 | 13th | 1st day | Introduction to Polymers |
| | | 2nd day | Classification of Polymers and types |
| | | 3rd day | Polymer reaction |
| | | 4th day | Properties and uses of Plastics |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 14 | 14th | 1st day | Properties and application of Thermosetting and Thermoplastic polymers |
| | | 2nd day | Properties of Elastomers and types |
| | | 3rd day | Uses of Elastomers |
| | | 4th day | Introduction to composites and Ceramics |
| **Sl No.** | **week** | **Day** | **Topics to be covered** |
| 15 | 15th | 1st day | Classification, composition and properties of Composites |
| | | 2nd day | Uses of particulate based and fibre reinforced composites |
| | | 3rd day | Classification and uses of ceramics |
| | | 4th day | Doubt clearance and Revision |