Name of the Faculty : Amit Phogat

Lesson Plan

Discipline : Mechanical Engg.

Semester : 4th

Subject : M.M.

Lesson plan duration : 16 weeks (from 06march 2023, to 23 june, 2023)

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| Week | Theory | | Practical | |
| Lecture Day | Topic (including assignments /tests) | Practical  Day | Topic |
| Week 1 | 1st | Introduction: Material, History of Material Origin, | 1st | Classification of about 25 specimens of materials/machine parts into(i)  Metals and non metals  (ii) Metals and alloys |
| 2nd | Scope of Material Science, different engineering materials and applications | 2nd | Classification of about 25 specimens of materials/machine parts into(i)  Metals and non metals  (ii) Metals and alloys  / Practical Work |
| 3rd | Classification of materials,Thermal, Chemical, Electrical, Mechanical  properties |
| 4th | Present and future needs of materials, Overview of Biomaterials  and semiconducting materials |
| Week 2 | 1st | Various issues of Material Usage- Economical, Environment and Social. | 1st | Given a set of specimen of metals and alloys (copper, brass, aluminum, cast iron, HSS, Gun metal); identify and indicate the various properties  possessed by them. / Theory Work |
| 2nd | Assignment | 2nd | Given a set of specimen of metals and alloys (copper, brass, aluminium, cast iron, HSS, Gun metal); identify and indicate the various properties possessed by them. / Practical Work |
| 3rd | Crystallography: Fundamentals: Crystal, Unit Cell, Space Lattice |
| 4th | Arrangement of atoms in Simple Cubic Crystals |
| Week 3 | 1st | Arrangement of atoms in BCC | 1st | Study of heat treatment furnace. / Theory Work |
| 2nd | FCC and HCP Crystals |
| 3rd | Number of atoms per unit Cell,  Atomic Packing Factor | 2nd | Study of heat treatment furnace. / Practical Work |
| 4th | Revision |
|  | 1st | Overview of deformation behaviour  and its mechanisms, | 1st | Study of a metallurgical microscope /  Theory Work |

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| Week 4 | 2nd | Behavior of material under load and  stress-strain |  |  |
| 3rd | Failure Mechanisms: Overview of  failure modes, |
| 4th | Fracture | 2nd | Study of a metallurgical microscope /  Practical work |
| Week 5 | 1st | fatigue and creep. | 1st | Study of Specimen polishing Machine  / Theory Work |
| 2nd | Assignment |
| 3rd | Metals And Alloys: Introduction: History and development of iron |  |
| 4th | History and development of steel,  Different iron ores, | 2nd | Study of Specimen polishing Machine  / Practical Work |
| Week 6 | 1st | Introduction: History and development of iron and steel,  Different iron ores, | 1st | To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials :i) Brass ii)Copper  iii)Grey iv)Malleable / Theory work |
| 2nd | Basic Process of iron-making and steel-making, |
| 3rd | Classification of iron | 2nd | To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials :i) Brass ii)Copper  iii)Grey iv)Malleable / Practical work |
| 4th | Classification of steel Definition, importance and criticality , Various grades of SS and their nomenclature |
| Week 7 | 1st | Cast Iron: Different types of Cast Iron,  manufacture and their usage. | 1st | To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials: v)Low carbon steel vi)High carbon steel vii) HSS /  Theory Work |
| 2nd | Steels: Steels and alloy steel, Manufacturing of SS: Process flow, |
| 3rd | Classification of plain carbon steels,Downstream facilities, Various finishes of SS | 2nd | To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials: v)Low carbon steel vi)High carbon steel vii) HSS /  Practical Work |
| 4th | Availability, Properties and usage of different types of Plain Carbon Steels, , Defects like Sensitization and microfissure, |
|  | 1st | Effect of various alloys on properties  of steel, Polishing of Stainless steel. Chemical treatment like pickling and passivation for SS. | 1st | To anneal a given specimen and find out difference in hardness as a result of annealing. / Theory Work |
| 2nd | Uses of alloy steels (high speed steel,  stainless steel,) Applications of SS; Demand of SS in various segments |

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| Week 8 | 3rd | Uses of alloy steels (spring steel,  silicon steel) | 2nd | To anneal a given specimen and find out difference in hardness as a result of annealing. / Practical Work |
| 4th | Non Ferrous Materials: Properties and  uses of Light Metals and their alloys |
| Week9 | 1st | Properties and uses of White Metals  and their alloys | 1st | To normalize a given specimen and to find out the difference in hardness as a result of normalizing / Theory  Work |
| 2nd | Assignment |
| 3rd | Test | 2nd | To normalize a given specimen and to find out the difference in hardness as a result of normalizing / Practical  Work |
| 4th | Revision |
| Week10 | 1st | Theory of Heat Treatment: Purpose of  heat treatment | 1st | Classification of about 25 specimens of materials/machine parts into   1. Ferrous and non ferrous metals 2. Ferrous and non ferrous alloys / Theory Work |
| 2nd | Solid solutions and its types, |
| 3rd | Iron Carbon diagram, | 2nd | Classification of about 25 specimens of materials/machine parts into   1. Ferrous and non ferrous metals 2. Ferrous and non ferrous alloys / Practical Work |
| 4th | Formation and decomposition of Austenite, Martensitic Transformation |
| Week 11 | 1st | Simplified Transformation Cooling  Curves | 1st | To harden and temper a specimen and to find out the difference in  hardness due to tempering. / Theory Work |
| 2nd | Processes hardening, tempering, |
| 3rd | Annealing | 2nd | To harden and temper a specimen and to find out the difference in hardness due to tempering. /  Practical |
| 4th | Normalizing |
| Week 12 | 1st | Case hardening | 1st | Practice And VIVA VOCE |
| 2nd | Surface hardening |
| 3rd | Types of heat treatment furnaces  required for above operations | 2nd | Practice And VIVA VOCE |
| 4th | Revision & Assignment |
| Week 13 | 1st | Engineering Plastics: Important sources of plastics | 1st | Practice And VIVA VOCE |
| 2nd | thermoplastic and thermo set and  their uses, |
| 3rd | Various Trade names of engg. Plastics, | 2nd | Practice And VIVA VOCE |
| 4th | Plastic Coatings |
|  | 1st | Advanced Materials: Composites- | 1st | Practice And VIVA VOCE |

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| Week 14 |  | Classification, properties, applications |  |  |
| 2nd | Ceramics-Classification, properties,  applications, Heat insulating materials |
| 3rd | Miscellaneous Materials: Properties and uses of Asbestos, Glass wool | 2nd | Practice And VIVA VOCE |
| 4th | Thermocole cork, mica, |
| Week 15 | 1st | Overview of tool and die materials,  Materials for bearing metals, | 1st | Practice And VIVA VOCE |
| 2nd | Spring materials, Physical metallurgy of Stainless Steel |
| 3rd | Materials for Nuclear Energy, Refractory materials. | 2nd | Practice And VIVA VOCE |
| 4th | Various phases in SS, Chromium-Nickel diagram |
| Week 16 | 1st | Schaeffler Diagram | 1st | Practice And VIVA VOCE |
| 2nd | Previous year question papers |
| 3rd | Previous year question papers | 2nd | Practice And VIVA VOCE |
| 4th | Previous year question papers |