

| Discipline: Metallurgical Engineering | | Semester: 4th semester | Name of the Teaching Faculty: Ms Sitanjali Khuntia |
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| Subject: Physical metallurgy Sub code: Th-2 | | No of days /week class allotted: 05 | Semester from Date: 10/03/2022 to 10/06/2022 |
| <i>Month</i> | <i>week</i> | <i>Class Day</i> | <i>Theory topics</i> |
| Mar | 1st | 1st | Structure of metals: Types of bonds |
| | | 2nd | Explain crystals and crystallography |
| | 2nd | 1st | Defining space lattice and unit cells |
| | | 2nd | Comparing different types of crystal lattice and primitive cell |
| | | 3rd | Defining SC, BCC, FCC & HCP |
| | | 4th | Define miller indices of a plane |
| | 3rd | 1st | Miller indices of a direction |
| | | 2nd | Isotropy and anisotropy in metallic material |
| | | 3rd | Imperfection in metallic material |
| | | 4th | Differentiation between types of imperfection point |
| | | 5 th | defect, line defect surface |
| | 4th | 1st | Defects and volume defects |
| | | 2nd | Defects of metal |
| | | 3rd | Define alloys and solid solution |
| | | 4th | Define solidification and crystallization |
| | Apr | 1st | 1st |
| 2nd | | 1 st | Define super cooling, under cooling, Degree of super cooling |
| | | 2nd | Explain mechanism of solidification |
| | | 3rd | Explain mechanism of crystallization, nucleation, critical size nucleus |
| | | 4th | Spontaneous nucleation, relation between ration of nucleation and grain growth |
| | | 5th | Discuss shape of crystals and solidification of ingot |
| 3rd | | 1st | Discuss shape of crystals and solidification of ingot |
| | | 2nd | Define equilibrium diagram |
| | | 3rd | Discuss the importance of equilibrium diagram |
| | | 4th | Draw equilibrium diagram of binary alloys |
| 4th | | 1st | State types of equilibrium diagram |
| | | 2nd | Explain isomorphous diagram with examples |
| | | 3rd | Explain eutectic type equilibrium diagram with examples |
| | | 4th | Explain the eutectoid equilibrium diagram |
| | | 5th | with example |
| 5th | | 1st | Explain the eutectoid equilibrium diagram with example |
| | | 2nd | Explain peritectic types and peritectoid equilibrium diagram with example |

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| | | 3rd | Explain peritectic types and peritectoid equilibrium diagram with example | |
| | | 4th | Define phase rule, lever rule and applying phase rule and lever rule in each equilibrium diagrams | |
| May | 1st | 1st | Draw iron carbon equilibrium diagram and Describe different phases and micro constituents in iron carbon diagram | |
| | | 2 nd | Discuss iron carbon equilibrium phase diagram | |
| | | 3 rd | Discuss iron carbon equilibrium phase diagram | |
| | | 4 th | Iron carbon phase diagram | |
| | 2nd | 1 st | Discuss carbon in iron to differentiate steel and cast iron | |
| | | 2 nd | Apply lever rule in iron carbon diagram | |
| | | 3 rd | Differentiate between iron carbon on iron cementite, and iron graphite diagram | |
| | | 4 th | Solid solution: Define solution, alloying | |
| | | 5 th | Explain different types of solid solution | |
| | 3rd | 1 st | Explain different types of solid solution | |
| | | 2 nd | Differentiate between substitutional and interstitial solid solution, chemical compound | |
| | | 3 rd | Mechanical mixture and intermetallic compounds | |
| | | 4 th | Define ordered and disordered solid solution Differentiate between ordered and disordered solid solution | |
| | 4th | 1 st | Describe the different factors governing the formation of solid solution | |
| | | 2 nd | Hume rothery rule for primary substitutional solid solution | |
| | | 3 rd | Intermediate phases: interstitial compound, electron compound, defect phase, electro valency compound | |
| | | 4 th | Define cast iron, Differentiate between steel and cast iron | |
| | | 5 th | Discussion between diff types of cast iron with their composition, factors affecting formation of gray or white cast iron | |
| | Jun | 1st | 1st | Define graphitization and role of graphitization in cast iron |
| | | | 2nd | Discussion of metallurgical microscope |
| 3rd | | | Differentiate between metallurgical and biological microscope | |
| 2nd | | 1 st | Describe different types of metallurgical microscope. State working principles of metallurgical microscope | |
| | | 2 nd | Define magnifying power and resolving power, spherical, and chromatic aberration | |
| | | 3 rd | Explain with sketch principle of electron microscope | |
| | | 4 th | Sample preparation and study the microstructure through microscope (metallography) | |