LESSON PLAN

Name of Faculty: Bharat Bhushan

Discipline: Mechanical Engg.

Semester: 4th

Subject: Materials&Metallurgy Lesson Plan Duration: 15Weeks

**Work Load: (3+2)**

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|  | **THEORY** | | |
| **WEEK** | **LECT** | **TOPIC** | **DATE** |
| **1** | 1 | **UNIT-1INTRODUCTION**  Material,Engineeringmaterials,History/TimelineofMaterialOrigin,ScopeofMaterialScience. |  |
| **2** | Overviewofdifferentengineeringmaterialsandapplications,Importance, |  |
| **3** | Classificationofmaterials,Differencebetweenmetalsandnon-metals, Physical andMechanical propertiesofvariousmaterials, |  |
| **2** | **4** | Presentandfutureneeds ofmaterials, |  |
| **5** | VariousissuesofMaterialUsage-Economical,Environment andSocial, |  |
| **6** | OverviewofBiomaterialsandsemi-conductingmaterials. |  |
| **3** | **7** | **UNIT-2.CRYSTALLOGRAPHY**Fundamentals:Crystallinesolidandamorphoussolid,UnitCell,SpaceLattice |  |
| **8** | Arrangementofatomsin SimpleCubic Crystals,BCC,FCCandHCPCrystals |  |
| **9** | Numberof atomsperunitCell, AtomicPacking Factor, coordinationnumber(without derivation), Defects/Imperfections,types andeffectsinSolidmaterials. |  |
| **4** | **10** | Deformation:Overviewofdeformationbehavioranditsmechanisms,Elasticand Plastic deformation, Behavior of material under load and stress-straincurve |  |
| **11** | FailureMechanisms:Overviewoffailuremodes, fracture,fatigueandcreep |  |
| **12** | **Revision** |  |
| **5** | **13** | **UNIT-3.METALLURGY:**Introduction,Coolingcurves of puremetals |  |
| **14** | dendriticsolidificationof metals,effect of grain size on mechanical properties, |  |

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|  | **15** | Binaryalloys,Thermalequilibriumdiagrams, Leverrule,SolidSolutionalloys |  |
| **6** | **16** | **UNIT-4.METALSANDALLOYS:**FerrousMetals:Differentironores |  |
| **17** | Flowdiagramforproduction ofironand steel |  |
| **18** | Allotropic forms ofiron-Alpha,Delta,andGamma. Basicprocessofmanufacturingofpigiron |  |
| **7** | **19** | Basicprocessofsteel-making |  |
| **20** | CastIron:Properties,typesofCastIron, manufactureandtheiruse. |  |
| **21** | Manufacture of Cast Iron, Steels: Plain carbon Steels and alloy steel |  |
| **8** | **22** | Classificationofplaincarbonsteels, PropertiesandapplicationofdifferenttypesofPlainCarbonSteels |  |
| **23** | Effectofvarious alloying elementsonpropertiesofsteel,uses of alloy steel |  |
| **24** | Non Ferrous Materials : properties and UsesofCopper,Aluminum andtheiralloys |  |
| **9** | **25** | **Revision** |  |
| **26** | **UNIT-5.HEATTREATMENT:**Definition and objectives of heat treatment |  |
| **27** | Iron carbon equilibrium diagram different microstructure so fironands teel, FormationanddecompositionofAustenite,MartensiticTransformation. |  |
| **10** | **28** | Variousheattreatmentprocesses-hardening,tempering |  |
| **29** | Annealing,normalizing. |  |
| **30** | Surfacehardening ,carburizing, nitriding,cyaniding , hardenability of steels |  |
| **11** | **31** | Typesofheattreatmentfurnaces(onlybasicidea), Measurementoftemperatureoffurnaces. |  |
| **32** | **Revision** |  |
| **33** | **UNIT-6.PLASTICS**:Importanceofplastics,Classification |  |
| **12** | **34** | Thermoplasticandthermoset, plasticandtheiruses |  |
| **35** | Varioustradenames ofplastics, Plasticcoatings |  |
| **36** | Foodgradeplastics.Applicationsofplasticsinautomobile anddomestic use, Rubberclassification–Naturalandsynthetic.Selectionofrubber |  |
| **13** | **37** | **Revision** |  |
| **38** | **UNIT-7.ADVANCED MATERIALS:**Heat Insulating materials- Asbestos, glass wool, thermocole, Ceramics-Classification,properties,applications. |  |
| **39** | Refractory materials–Dolomite, porcelain. Glass– Sodalime, borosil, Abrasivematerials, |  |
| **14** | **40** | Joining materials / Adhesives–Classification, properties and applications |  |
| **41** | Composites-Classification,properties,applications |  |
| **42** | Materials for bearing metals, Materials for Nuclear, Energy |  |

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| **15** | **43** | Smartmaterials-propertiesandapplications |  |
| **44** | **Revision** |  |
| **45** | **Revision** |  |

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| **PRACTICAL** | | |
| **TURN** | **EXPERIMENT** | **DAT E** |
| **1** | **1**  Classificationofabout25specimensofmaterials/machineparts  **(i)**Metalsandnonmetals**(ii)**Metalsandalloys  **iii)** Ferrousandnonferrousmetals **iv)**Ferrousandnonferrousalloys |  |
| **2** | **RepeatofExperiment-1** |  |
| **3** | **2.**  Givenasetofspecimen ofmetalsandalloys(copper,brass,aluminum, castiron,HSS,Gunmetal)Identifyandindicatethevariousproperties possessedbythem |  |
| **4** | **RepeatofExperiment-2** |  |
| **5** | **3**   1. Studyofheattreatmentfurnace. 2. Studyofathermocouple/pyrometer. |  |
| **6** | **4**  Studyofametallurgicalmicroscopeandaspecimenpolishingmachine. |  |
| **7** | **5**  To prepare specimens of following materials for microscopic examination and toExamine the microstructure of the specimens of following materials. At least anytwo:i)Brassii) Copperiii) CastIron,iv)MildSteelv)HSS,vi)Aluminium |  |
| 8 | **RepeatofExperiment-5** |  |
|  | **6**  Toannealagiven specimenandfindoutdifferenceinhardnessasaresult |  |
| **10** | **RepeatofExperiment-6** |  |
| **11** | **7**  To normalize a given specimen and to find out the difference in hardness as aresultof Normalizing. |  |
| **12** | **RepeatofExperiment-7** |  |
| **13** | **8**  Tohardenandtemper aspecimenandtofindoutthedifferenceinhardness |  |
| **14** | **RepeatofExperiment-8** |  |
| **15** | **VIVA** |  |