

GOPAL KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

GOURAHARI VIHAR, PO: RANIPUT, JEYPORE – 764 005

LESSON PLAN

**Name of the Subject: INTRODUCTION TO PHYSICAL METALLURGY
AND ENGINEERING MATERIALS**

Subject Code:MFPC2002

Course Structure:3-0-0

Name of the Faculty: Er. Ch. Krushna Chandra Reddy

Semester: 3rd Semester

Branch:Mechanical

Semester From: JULY to DECEMBER

No. of Weeks: 16

Week	Day	Theory / Practical Topics	Classes
1		Unit 1 – Structure and Properties of Engineering Materials	12
	1	Introduction to material science and its importance	1
	2	Classification of engineering materials	1
	3	Properties of engineering materials	1
2	4	Crystal structures: BCC, FCC, HCP	1
	5	Mechanism of crystallization	1
	6	Defects in crystal structure	1
3	7	Plastic deformation: slip and twinning	1
	8	Effects of cold working	1
	9	Strengthening mechanisms	1

Week	Day	Theory / Practical Topics	Classes
4	10	Hot working processes	1
	11	Revision and numerical discussion	1
	12	Tutorial/problem-solving (Module-I)	1
		Unit 2 – Constitution of Alloys and Phase Diagrams	9
5	13	Constitution of alloys: pure metals and phases	1
	14	Solid solutions: substitutional and interstitial	1
	15	Hume-Rothery rules	1
6	16	Binary phase diagrams	1
	17	Phase diagram rules	1
	18	Iron-carbon equilibrium diagram	1
7	19	Phase transformations in iron-carbon system	1
	20	Lever rule and applications	1
	21	Tutorial/problem-solving (Module-II)	1
		Unit 3 – Heat Treatment of Steels	9
8	22	Heat treatment of steels: introduction	1
	23	Annealing and its types	1
	24	Normalizing and hardening	1
9	25	Structure and properties of engineering materials	1

Week	Day	Theory / Practical Topics	Classes
	26	Numerical/problem-solving session	1
	27	Revision of Module-III	1
10	28	TTT diagrams and interpretation	1
	29	Continuous cooling transformation	1
	30	Tempering and sub-zero treatment	1
		Unit 4 – Surface Hardening and Heat Treatment Processes	9
11	31	Defects due to heat treatment	1
	32	Surface hardening: induction and flame hardening	1
	33	Case hardening: carburizing and nitriding	1
12	34	Cyaniding and carbonitriding	1
	35	Diffusion coating	1
	36	Tutorial/problem-solving (Module-IV)	1
13	37	Revision session	1
	38	Numerical discussion	1
	39	Case study on heat treatment applications	1
		Unit 5 – Ferrous, Non-Ferrous and Composite Materials	9
14	40	Ferrous alloys and classification of steels	1

Week	Day	Theory / Practical Topics	Classes
	41	Effect of alloying elements	1
	42	Steel designation systems	1
15	43	Cast iron: types and applications	1
	44	Non-ferrous alloys	1
	45	Plastics and ceramics	1
16	46	Composite materials	1
	47	Applications of engineering materials and material selection	1
	48	Revision, doubt clearing and exam preparation	1

Books Recommended

1. *Material Science and Metallurgy* by O.P. Khanna
2. *Physical Metallurgy* by V. Raghavan
3. *Materials Science and Engineering* by William D. Callister
4. *Introduction to Physical Metallurgy* by Sidney H. Avner

NPTEL Lecture

1. <https://nptel.ac.in/courses/113106031>

2.<https://nptel.ac.in/courses/113101003/>