

# GANPAT UNIVERSITY

## FACULTY OF ENGINEERING AND TECHNOLOGY (DIPLOMA PROGRAMMES)

Programme	Diploma Engineering	Branch/Spec.	Mechatronics Engineering						
Semester	III	Version	1.0.0.0						
Effective from Academic Year	2019-20	Effective for the batch Admitted in	July 2018						
Subject code	1MC2301	Subject Name	Principles of Material Science and Metallurgy						
Teaching scheme			Examination scheme (Marks)						
(Per week)	Lecture(DT)	Practical(Lab.)	Total	CE	SEE	Total			
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

Learning Outcome:

The theory should be taught and practical should be carried out in such a manner that students are able to

1. Identify metal and non-metal and describe various properties of material.
2. Prepare specimens for microscopic examination
3. Explain various heat treatment processes
4. Identify various ferrous and non-ferrous metals and alloys based on composition and properties for prescribed application
5. Select the materials for various engineering application.

Theory syllabus

Unit	Content	Hrs
1.	<p><b>INTRODUCTION OF ENGINEERING MATERIALS AND METALLURGICAL MICROSCOPE</b></p> <p>[A] General requirements of engineering materials. Need of engineering materials. Mechanical, Chemical and Electrical properties of materials. Classification of metals and non-metals. Types of bonds.</p> <p>[B] Need and importance of metallographic examination. Working principle of Metallurgical microscope. Preparation of specimen for microscopic examination.</p>	06
2.	<p><b>PHASE DIAGRAMS</b></p> <p>Molecular arrangement of atom in solid, liquid and gases. Structure of solids. Solidification of metals. Equilibrium diagram. Iron carbon diagrams. T.T.T diagram</p>	07
3.	<p><b>FERROUS METALS AND ITS ALLOYS</b></p> <p>Need, concept and classification of Ferrous metals and its alloys. Types of cast iron, their properties and applications. Types of steel, their properties and applications. Effect of alloying elements on steel and cast iron. Standards and designations of steel and cast iron as per BIS.</p>	09
4.	<p><b>HEAT TREATMENT OF STEEL.</b></p> <p>Definition and advantages of heat treatment. Types of heat treatment process. Types of Annealing process. Normalizing process. Hardening and Tempering. Various hardening process.</p>	06
5.	<p><b>NONFERROUS METALS AND ITS ALLOYS</b></p> <p>Introduction about Nonferrous metals. Classification and importance of Nonferrous metals and its alloys. Properties and applications of copper and its alloys. Concept of aluminium and its alloys. engineering applicationsof nonferrous metals.</p>	04
6.	<p><b>NONMETALLIC MATERIALS</b></p> <p>Introduction and classification of non-metallic materials. Types, applications and properties of non-metallic materials such as Plastics, Ceramics, Rubber, Refractory materials,oils etc. Factors to be considered while selecting the materials.</p>	06
7.	<p><b>COMPOSITE MATERIALS</b></p> <p>Need of composite materials, its types and properties and applications</p>	03

8.	<b>POWDER METALLURGY</b> Basic concept of powder metallurgy and its application, merits, demerits. Flow diagram of powder metallurgy. Sintering, pre-sintering. Manufacturing processes of powder metallurgy.	04
<b>Practical content</b>		
Study type and performing type seven practicals based on above syllabus.		
<b>Practical No.</b>	<b>Title of Practical</b>	<b>Hours.</b>
1	Identify ten to fifteen materials by laboratory surrounding (metallic and non metallic). List properties and applications of each above identified materials also identify main alloying elements and reasons to add them.	4
2	Study Metallurgical Microscope and examine the given specimen by use of Metallurgical Microscope	2
3	Prepare ferrous micro specimens and examine them. Also prepare report on this.	4
4	Study various heat treatment furnaces.	2
5	Study various heat treatment processes and perform hardening process on ferrous material. Measure the hardness before and after hardening	4
6	Study corrosive materials to identify different types of corrosion of metals.	4
7	Each student will explain at least one diagram (assigned by teacher-may be part of iron-carbon diagram, TTT curve for specific material etc.) to all batch colleagues.	10
<b>Text Books</b>		
1.	Material Science, R.S. Khurmi & R.S. Sedha, S.Chand	
2.	fundamentals of materials science and engineering: an integrated approach by William D.Calister	
<b>Reference Books</b>		
1.	Material Science, GBS Narang, Khanna Publishers, New Delhi.	
2.	Material Science, R.K. Rajput, Laxmi Publication, Dariyaganj, New Delhi	
3.	Physical Metallurgy, Sidney Avner, Tata McGraw-Hill Education	