GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Bachelor of Vocation (B.Voc), 2nd Semester
Branch: Production Technology
Subject Name: Material Science and Metallurgy
Subject Code: 21120304

With effective from academic year 2021-22

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Basic principles of science are used to study the structure-properties relationships of various materials for their proper applications in this subject. Especially study of different types of ferrous and non-ferrous metals and alloys, in terms of their composition, structure, properties and applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	50	0	0	0	50

Sr. No.	Topic	No. of Hours	Weightage %
01	**Introduction to Material Science and Metallurgy:** Basics of Engineering Materials, their Classifications and Application, Basics of Advance Engineering Materials, Engineering requirements of materials, Properties of engineering materials, Criteria for selection of materials for engineering Applications.	5	15
02	**Structure of Metals and their Deformation** Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery re-crystallisation and grain growth, solid solutions, alloys and inter metallic compounds, effect of grain size on properties of metals	9	20
03	**Metals-Ferrous Metals** Classification of iron and steel, Cast iron types as per I.S. - White, malleable, Grey, Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications, Alloy Steel: Effect of alloying various elements, viz Cr, Hi, Co, V,W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel - High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.	10	25
04	**Heat Treatment of Metals:** Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. and `S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening.	8	20
05	**Non Destructive Testing:** Non Destructive testing of materials such as Radiography Testing, Dye Penetration Testing, Magnetic Particle Testing, Ultrasonic Testing. Eddy current testing with their Principleof non-destructive testing, the test methods, relative merits, demerits and applications.	8	20

Distribution of marks weightage for cognitive level:

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**20**	**20**	**-**	**-**	**-**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Material Science & Metallurgy by O. P. Khanna
2. MATERIAL SCIENCE: RS Khurmi& RS Shedha
3. Practical Non-Destructive Testing, Baldev Raj, T. Jayakumar and M. Thavasimuthu, Narosa Pub. House. ASM Handbook.

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO 1	Understand the basic concept of Material Science and Metallurgy	20
CO 2	To learn Crystal Geometry and crystallization	20
CO 3	Know about the metals and alloys and their applications	20
CO 4	To understand Allotropy of Iron, Iron - carbon equilibrium system and heat treatment	20
CO 5	To understand different non-destructive testing methods	20

List of Open Source Software/learning website:

https://nptel.ac.in,