

GANPAT UNIVERSITY

FACULTY OF U.V. PATEL COLLEGE OF ENGINEERING

Programme		Degree Engineering			Branch/Spec.	Automobile Engineering			
Semester		IV			Version	1.0.0.0			
Effective from Academic Year			2018-19		Effective for the batch Admitted in			June 2017	
Subject code		2AE402		Subject Name		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:									
None									
Learning Outcome:									
Learning Outcomes:									
After completion of this course, student will be able to									
<ul style="list-style-type: none"> • The student can identify different areas of material science & metallurgy. • Students can find the applications of all the areas in day to day life. 									
Theory syllabus									
Unit	Content								Hrs
1	Introduction to Material Science Metallurgy: Classification of engineering materials, Engineering requirements of materials, Properties of engineering materials, Criteria for selection of materials for engineering applications.								4
2	Metallic Materials: Types, Properties and applications, Structure of metals, Fracture, Macro-examination, Spark Test, Sculptures print, Macro-etching, Microscopic examinations, Magnetic testing, Chemical analysis of steel and iron for carbon, Sulphur & Phosphorous.								5
3	Cast Iron: Iron-Carbon diagram, Plain carbon steels, Allotropy of iron.								5
4	Crystal geometry and Crystal Imperfections: Crystallization of metals, Solidification of an alloy, Solid solution types. Thermal Equilibrium diagrams of binary alloys. Effects of structure on physical properties.								5
5	Phase and Phase equilibrium: Cast Iron: Grades, Alloy Cast Iron, Malleable Iron, S. G. Iron								5
6	Wrought Iron: Wrought Iron: Properties and uses.								5
7	Steel: Classification of Steels, Properties and uses, Effects of alloying metals.								5
8	Heat Treatment of Steels Study of Heat-Treatment processes such as Normalizing, Annealing, Spheroid zing, Hardening, Tempering, Austempering, Martempering, Case-Hardening, Nitriding, Cyaniding, Induction hardening, Flame-hardening, Ageing. Application of above processes in mechanical components such as gears, Bearing, Turbine blades, Crankshafts, pistons, Cutting tool materials								8
Practical content									
The term work to be prepared by the candidates shall consists of technical report of about ten experiments performed by the candidates out of which at least two experiments will be based on each of the following topics listed under the headings of									
a. Physical metallurgy									
b. Ferrous metallurgy									
c. Non-ferrous metallurgy									

Text Books	
1	Sidney H. Avner, "Introduction to Physical Metallurgy", T.M.H. Publisher
2	T.V.Rajan & C.P. Sharma, "Heat treatment", PHI Publisher
Reference Books	
1	V. Raghavan, "Physical Metallurgy – Principles & Practice", PHI Publisher
2	Y.Lakhtin, "Engineering Physical Metallurgy & Heat-Treatment", C.B.S. Publisher
3	Fontanna M.G. & Green N.D, "Corrosion Engineering", TaTa McGraw Hill
4	ChawlaKrishan K, "Composite Materials", Spriger
5	George E. Dieter, "Mechanical Metallurgy", TaTa McGraw Hill
6	Poole Charles P; Owens Frank J, "Introduction to Nano Technology", Johan Wiley and Sons.