GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VI

Metallurgical Engineering

Subject Name: **Advanced Materials and Applications**
Subject Code: **162104**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
3	1	0	4	70	30	50

Sr. No	Course Content	Total Hrs.
1	**Special steels** Ferritic, Austenitic, Martensitic, Duplex and Precipitation hardenable stainless steels, Dual phase steels, TRIP steels, Maraging steels, High speed steels, Hadfield steels, Free cutting steels, Ausformed steels, Tool Steels, manganese steels, chrome steels, electrical steels, bearing steels, spring steels, heat resistant steels, creep steels, HSLA steels	14
2	**Alloy cast iron** High silicon cast iron, Ni-hard, Heat resistant cast iron	04
3	**Light metals and their alloys** Aluminium, magnesium and titanium alloys, Metallurgical aspects, Mechanical properties and applications	03
4	**Super alloys** Iron base, nickel base and cobalt base super alloys, Composition, Properties and their applications	04
5	**Rapid Solidification** Techniques, Production of metallic glasses, Atomic arrangement, Comparison with crystalline alloys, properties & applications	05

6	**Nano materials & technology** Definition, Types of nanomaterials including carbon nanotubes and nanocomposits, Methods for creating nano structures, Processes for producing ultrafine powders - physical synthesis and chemical synthesis, Physical and mechanical properties and their applications	07
7	**Smart materials** Shape memory alloys, Piezoelectric materials, Electro-rheological fluid, Magneto- rheological fluid	05
8	**Biomaterials** Property requirement, Concept of biocompatibility, Cell-material interaction and body response to foreign materials, Important biometallic alloys, Ni-Ti alloy, Co-Cr-Mo alloys	05
9	**Miscellaneous Advanced Materials** Magnetic materials, Engineering polymers, ceramics and composites, aerospace materials, cryogenic materials, semi conducting and superconducting materials	07

Text Book:

1. The Science and Engineering of Materials by D. R. Askeland and P. P. Phule, Thomson Publication

Reference Books:

1. Advances in Material Science by R. K. Dogra and A. K. Sharma
2. Material science by Van Black.
3. Engineering Materials and Applications by R. A. Flinn and P. K. Trojan
4. Materials, their Nature, Properties and Fabrication by R. A. Lindberg and S. D. Sehgal, S Chand & Co.
5. Light Alloys: Metallurgy of Light Metals by I. J. Polmear
6. Nano Technology by Gregory Tirp, Springer Verlag, 2005