GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. SEMESTER : VIII
METALLURGICAL ENGINEERING

Subject Name: **MODERN TECHNIQUES FOR MATERIAL CHARACTERIZATION**

Sr. No.	Course Contents	Total Hrs
1.	Importance of Material characterization, Classification of techniques for characterization	**4**
2.	Thermal Analysis techniques: Principle, Working and application of DTA, TGA, TMA and DSC.	**8**
3.	Advance Optical microscopy techniques: Differential Interference Contrast (DIC) Illumination, Hot Stage Microscopy, color metallography, and image analysis techniques.	**8**
4.	Electron microscopy: Principle, Construction and Working of TEM, SEM, STEM with their merits, demerit and applications, techniques of replica preparation.	**12**
5.	Spectroscopic Techniques for chemical analysis:, UV-Visual(UV-VIS), IR & Raman spectroscopy, FTIR, EDS & WDS, X-ray Fluoroscopy (XRF), Atomic absorption spectrometer(AAS), Atomic Emission spectroscopy (AES)	**8**
6.	Diffraction method, X-ray diffraction, determination of crystal structure, lattice parameter, crystallite size by diffraction techniques / low angle X-ray scattering technique.	**10**
7.	Surface characterization: XPS (ESCA), Auger Electron Spectroscopy, Electron Probe Micro Analysis (EPMA), Nuclear Magnetic Resonance (NMR) Technique.	**10**

TEXT/REFRENCES

1. F. Weinberg, Editor, Tools & Techniques in Physical Metallurgy, Vol. I & Vol. II, Marcel Dekker, 1970.
2. John P. Sibilia, A guide to Material Characterization & Chemical Analysis, VCH Publishers, 1988.
3. J.M. Walls, Editor, Methods of Surface Analysis : Techniques & Applications, Cambridge University Press, 1990.
4. B.D. Cullity, Elements of X-ray diffraction, Addison-Wesley Publishing Company, INC, 1978.
5. Bernhard Wounderlich, Thermal Analysis, Academic Press, INC, 1990.
6. B.L. Gabriel, SEM : A user's manual for materials Science, American Society for Metals, 1985.
7. An Introduction to Materials Characterization by P. R. Khangaonkar, Penram International Publishing (India) Pvt. Ltd.