GUJARAT TECHNOLOGICAL UNIVERSITY

Rubber Technology

B. E. SEMESTER: VI

Subject Code: **162604**

Subject Name: **Characterisation of Rubber**

Sr. No.	Course Contents	Total Hrs
1.	**Chemical Analysis** : Identification of Rubber, Polymer, Spot test & Pyrolysis tests, Extract analysis, Total Sulfur, Organic Sulfur, In-organic Sulfur, Free Sulfur, Filler Analysis, Chemical Tests likeTotal Alkalinity, KOH number, VFA number, Nitrogen, Total Ash, Metallic Constituents, Boric acid etc.,Test Methods for NR, SBR, NBR, CR, Butadiene.	10
2.	**Introduction to Standard Organizations:** like BIS, ASTM, ISO, BS, DIN etc. Their importance in the quality control of Rubber & Rubber Products, Preparation of test pieces conditioning & test atmosphere.	05
3.	**Limitations of Test Results**:- Statistics, Variability, Accuracy & Precision, Relevance & Significance, Sampling & Quality control, Treatment & Results, Design of Experiments.	05
4.	**Analytical Analysis** : **(1) Chromatography** : Gas Chromatography (GC), Thin Layer Chromatography (TLC), Gel Permeation Chromatography (GPC), High Performance Liquid Chromatography (HPLC) **(2) Spectroscopy:** Infrared Spectroscopy(IR), Fourier Transform Infrared Spectroscopy(FTIR), Nuclear Magnetic Resonance Spectroscopy(NMR), UV, Theory, Principle & Application of Rubber, Blends, Composites & Additives, Study of Thermal Transitions & Evolved Gas Analysis(EGA) **(3) Microscopy** :Applications & Principle of Optical Microscope, Scanning Electron Microscope, Transmission Electron Microscope, Phase Transition, Compatibility Evaluation, X-ray Diffraction Techniques (WAXS, SAXS), ESCA, ESR, Mass Spectroscopy	15
5.	**Thermal Analysis :** Principles & Applications (Tg, Crystallinity, Life Prediction, Kinetics of Degradation & Cp) of Thermo gravimetric Analysis(TGA), Thermo mechanical Analysis(TMA), Differential Thermal Analysis(DTA), Differential Scanning	15

	Calorimeters(DSC), DMA, DETA, Dilatometry of Rubbers, Rubber composites & blends, Thermo sets & Fibers **Thermal Analysis in Polymer Flammability :** Introduction, Polymer Flammability, Thermal Analysis & Flammability Evaluation, Conclusions **Thermal Analysis of Additives in Polymers :** Introduction, Protective agents, Plasticizers, Other Additives etc.	
6.	**Experimental Methods:** Polymer synthesis, isolation & purification of polymers, polymer fractionation, and determination of glass transition temp. etc	04

Practical:

It should be based on theories.

Text Books:

1) Thermal Characterization of Polumeric Materials by Edvin A. Turi
2) Science & Technology of Rubber, by James E. Mark, Burak Erman, Frederich R. Eirich
3) Principles of Polymer Systems, by Ferdinad Rodrigeuz

Reference Books:

1. Polymer Characterization-1989, - by Schroden
2. Understanding Polymer Morphology-1995, - by Woodhard
3. Thermal Degradation of Polymer Materials-2005, - by PIELICHOWSKI