



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3724005

Semester – II

Subject Name: Thermal & Thermal Analysis of Rubber & Rubbery Materials

Type of course: Program Elective-III (M.E.Rubber Technology)

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

Content:

Sr. No	Course Content	Total Hrs
1.	Instrumental Techniques used for Thermal Analysis of Rubbers and Rubbery Materials: Introduction, Differential Thermal Analysis (DTA) , Differential Scanning Calorimetry (DSC), Derivative Thermogravimetry (DTG), Evolved Gas Analysis (EGA) or Evolved Gas Detection (EGD), Thermo mechanical Analysis (TMA) and Thermodilatometry (TD) or Thermodilatometric Analysis (TDA), Parallel Plate Rheometry (PPR), Stress Relaxation Spectrometry, Dynamic Mechanical Analysis (DMA), Torsional Braid Analysis (TBA), Thermally Stimulated Current (TSC), Relaxation Map Analysis (RMA), Differential Photo Calorimetry (DPC), Dielectric Analysis (DEA) or Dielectric Thermal Analysis (DETA).	10
2.	Applications of DSC and TGA for the Characterization of Rubbers and Rubbery Materials: Introduction, Differential Scanning Calorimetry of Rubbery Materials, Thermo gravimetric Analysis of Rubbery Materials, Thermal Degradation and Stability of Rubbers by TGA, Miscellaneous Applications of TGA	12
3.	Micro-thermal Analysis of Rubbery Materials: Introduction, Basic Principles of μ TA, Modes of Micro-thermal Analysis, Micro-thermal Analysis of Rubbery Material, Morphological Investigation in Polymer Blends, Thin Films/Coating on the Substrate, Multilayer Material Characterization, Thermal Characterization of Micro-spheres, Powder Particle Characterization, Characterization of Microspores, Characterization of Nanostructure Material.	10
4.	Thermal Analysis in Understanding Rubbery Matrix and Rubber-Filler Interactions: Introduction, Thermal Analysis and Investigation of Heterogeneous Materials, Structure-Properties Relationships in Particulate Filler/Rubbery Matrix Systems, Description of the Shape and Space Distribution of Filler Particles, Filler-to-Matrix and Filler-to-Filler Interactions as Investigated by Thermal Analysis,	10



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	Thermogravimetry, DTA and DSC.	
5.	Thermal Analysis of Rubber Products: Introduction, Thermal Analysis of Rubber Based Vibration Control Devices, Thermal Analysis of Rubber Seals, Thermal Analysis of Rubber-Based Cable Sheathing Compounds, Thermal Analysis of Rubber Based Adhesives, Thermal Analysis of Rubber Based Insulators, Thermal Analysis of Thermal Interface Materials (TIM), Thermal Analysis of Automobile Tyres.	12

Reference Books:

- Thermal Analysis of Rubbers and Rubbery Materials: Editors: Namita Roy Choudhury & Prajna P De and Naba K. Dutta.
- Thermal Characterization of Polymeric Materials by EDITH A. TURI

Course Outcome:

Sr. No.	CO Statement	Marks % weightage
CO-1	Understand about Instrumental Techniques used for Thermal analysis of Rubbers & Rubbery Materials.	15
CO-2	Learn the applications of DSC & TGA for Characterization of Rubbers.	15
CO-3	Learn about Micro-thermal Analysis of Rubbery Material.	15
CO-4	Able to understand Characterization of Nanostructure Material.	20
CO-5	Develop the Structure-Properties Relationships in Particulate Filler/Rubbery Matrix Systems.	20
CO-6	Learn and Understand the Thermal Analysis of Rubber Products.	15

List of Experiments:

Tutorials/Presentation/Practicals based on above topics

Major Equipments: Differential Scanning Calorimeter, Thermo mechanical Analyzer, Differential Thermal Analyzer, UV spectrometer etc.

List of Open Source Software/learning website:

<http://www.crcpress.com>

<http://pubs.acs.org/>

www.cjps.org/EN/article

www.sciencedirect.com/