

GUJARAT TECHNOLOGICAL UNIVERSITY
M.E.in Rubber Engineering
Semester: I

Subject Name: **Mixing of Rubbers**

Subject Code: **714002**

Sr. No	Course content
1.	Overview of Mixing of Rubber: Unit Processes, Interpretation of Mixing Process, Compaction as a part of the Mechanism in incorporating Carbon Black into an Elastomer.
2.	Polymerisation and Molecular Architecture: Natural Rubber & Synthetic Rubbers.
3.	Mill Processibility: Interpretation of Mill Processibility, Science of Mill Processibility.
4.	Viscoelasticity and Fracture: Introduction to Viscoelasticity, Viscoelasticity for Characterisation, Viscoelastic Behaviour of Rubber in an Internal Mixer, Mechanism of Fracture of Gum rubber.
5.	Linear Viscoelasticity: Linear Viscoelasticity and mixing of rubber, Relaxation time and its distribution, Linear viscoelasticity as a conceptual background for the mixing of rubber
6.	Viscoelastic Characterisation of Rubber Compounds: Viscoelastic Properties of Compounds, Strain and Strain-rate Amplification, Unique Characteristics of Compounds.
7.	Application of Characterisation Methods for a Specific Problem : Effect of Fillers and Rubber Structures on Tensile behavior of filled, Unvulcanised compounds of Cis 1,4-Polybutadiene.

8.	Reinforcing Fillers & Liquid Additives: Reinforcing Fillers- Mixing case of fillers, structure of aggregate and agglomerate. Liquid Additives- The Energy Aspects of Mixing Rubber: Energy Balance-Experiment, Experimental Programme.
9.	Proposed Model of a Mixing Mechanism: Changes in material during mixing, Mechanical actions, Material-machine interaction, Macroscopic versus microscopic deformation.
10	Model of Material Behaviour in the Internal Mixer: Material Properties, Pressure profile in the internal mixer, deformation of material between rotor edge and chamber wall, Probability and distribution in mixing, Calculation of Mixing energy.
11	Nano and Molecular Scale of Mixing: Chemical Reactions during Mixing, Optimum state of the elastomer for mixing, Improvements in rotor design.
12	Post-Mixing Processes & Testing: Causes of non uniformity in feeding, Material behavior, flow Mechanism etc.

Note: Practicals based on above topics

Text Books:

1. The Science & Practice of Rubber Mixing by Nakajima 1st Edition 2000.
2. Mixing of Rubber By Dr. Gupta

Reference Books:

1. Mixing of Rubbers by Dr. John M.Funt.
2. Viscoelastic Properties of Polymers by John D.Ferry