

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E Semester: 4 Rubber Engineering

Subject Code 142601

Subject Name RUBBER COMPOUNDING MATERIALS

Sr.No	Course contents
1.	Organic Materials: Hydrocarbons, Unsaturated Hydrocarbons, Aromatic Hydrocarbons, Phenols, Phenolic Antioxidants, Aldehydes & Ketones, Alcohols, Fatty Acids, Amines, Rubber Chemicals, Paraphenylene diamines derivatives, Solvents, Fictices, Organic Peroxides, Resins, Quantitative Analysis of Organic Compounds
2.	Inorganic Materials: Calcium & Magnesium, Copper & Zinc, Compounds of Aluminum, Silicone, Ozone, Other Inorganic Compounds used in Rubber Industries, Sulfur, Water
3.	Rubber Additives: Basic Principles, Introduction, Classification of Additives, Recurring Theories, Synergism, Toxicity
4.	Antidegradants: Introduction, Autoxidation of Hydrocarbon Polymers, Chain-Breaking Antioxidants, Amine & Phenolic Antioxidants, Antiozonants, Prevention of Ozone Attack, Use of Waxes & Saturated Polymer for Ozone Protection
5.	Compounding Materials: Plasticizers, Process aids & Fictices, Accelerators, Blowing Agents, Bonding Agents, Other Compounding Aids, Peptisers, Colors & Pigments, Special Purpose Additives, Non Black Fillers.
6.	Environmental requirements in Compounding
7.	Principles of Compounding: Introduction, The ingredients & formulation of a mix, Compounding to meet processing requirements, Compounding of vulcanizate properties, Compounding for bonding to non-rubber substrates
8.	Art of compounding: Calculation of compound cost of a recipe, Calculation of compound volume of a recipe, Calculation of compound specific gravity of a recipe, formulation of mix, Processing requirements
9.	Layered Silicate-Polymer Interrelation Compounds: Introduction, Variation in Host Materials for Polymer Intercalation Katolinite, Layered Double Hydroxide, Examples of the Role of Polymers in Interlayer

10.	Polymer-Clay Nano-Composites : Introduction, Synthesis Methods, Monomer Intercalation Methods, Monomer Modification Method, Co-Vulcanization Method, Common Solvent Method, Polymer Melt Intercalation Method
11.	Carbon Black: Introduction, Properties, Rubber compounding aspects, Furnace process, Thermal process channel or impingement process, Lampblack process, Particles size, Structure, Particle porosity, Classification. Effect of properties of carbon black on properties of rubber vulcanizates.
12.	Reinforcement by fillers: Introduction, reinforcement, Factors influencing elastomers reinforcement, fillers characteristics, main effects of fillers, characteristics of vulcanizate properties, Influence of fillers characteristics on the cross linking process, Filler incorporation, the roll of bound rubber, reinforcement and crosslink density, The mechanism of reinforcement & its applications

Reference Books:

1. Rubber Engg., by IRI
2. Rubber Technology Handbook, by Hofmann
3. Science & Technology of Rubber, by J. Mark, B. Erman, F. Eirich
4. Rubbery Materials & their Compounds, by J. A. Brydson
5. Rubber Technology & manufacture, by C. M. Blow
6. Rubber Product Mfg. Technology, by Anil K. Bhowmick
7. Polymer-Clay Nanocomposites, by T.J. Pinnavaia & G. W. Bell