



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3162609**

**Semester – VI**

**Subject Name: Rubber Compound & Product Testing**

**Type of course: Professional Elective Course- II**

**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.	Content	Total Hrs
1	Importance of Testing in Rubber Industries: Introduction, Statistics, Precision, Accuracy & Validity, Specimen Preparation, Standard Temperature, Organisations Producing Standards, Preparation of Test Pieces.	6
2	Tests on Unvulcanized Rubbers: Plasticity, Scorch & Cure rate, tack, Plasticity Retention index, Determination of Specific gravity, Green Strength, Shrinkage.	6
3	Mass, Density and Dimensions: Mass, Density, Dimensions Standard methods, Non-standard methods, surface roughness, extensometry, dimension stability, dispersion.	4
4	Short-Term Stress & Strain Properties: Hardness, Tensile Stress/Strain, Compression/Stress/Strain, Shear Stress/Strain, Flexural (Blending) Stress/Strain, Tear Test.	7
5	Dynamic Stress - Strain Properties & Fatigue: Rebound Resilience, Dynamic Modulus, Loss Modulus, Tan Delta, Loss Compliance, Shear Modulus (Free Vibration Methods, Forced Vibration Methods), Flex-cracking & Cut growth Tests, Heat Buildup.	7
6	Creep, Relaxation & Set, Friction & Wear: Creep, Stress relaxation, Compression set (constant load, constant deflection), Friction and Wear, Abrasion property.	6
7	Electrical Tests: Resistance or resistivity, Surface charge, Electric strength, Tracking resistance, Power factor and permittivity.	6



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8	Effect of Temperature & Environmental Resistance: Thermal expansion, Transition temperature, Low temperature properties, Heat ageing, Effect of liquids, Volume Swelling, Water absorption, Effect of gases, Effect of ozone, Weathering, Biological attack, Fire, Radiation	6
9	Permeability: Gas Permeability, Constant volume method, Constant pressure method, Carrier gas method, High Pressure measurements & Vapor Permeability.	6

### Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	10	15	15	10	10

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Reference Books:-

- Physical Testing of Rubber by R.P. Brown
- Rubber Engineering by Indian Rubber Institute
- ASTM Standards for Rubbers and Rubber products

### Course Outcome:

After learning this course students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Summarize the importance of testing, calibration and need of standardization in Rubber industries	10
CO-2	Evaluate different physical tests for Rubber compound and products	15
CO-3	Analyze short-term and dynamic stress- strain properties for Rubber products	15
CO-4	Solve the problems related to quality of rubber products and environmental factors	15
CO-5	Identify suitable test for set, abrasion, electrical, thermal and ageing properties	15



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## **List of Experiments:**

Tutorials/Presentation/Practicals based on above topics.

## **Major Equipments:**

Hardness Tester, Specific gravity balance, Weighing balance, Adhesion Tester, Tensile Tester, Spilt Tear Tester, etc.

## **List of Open Source Software/learning website:**

- <http://files.hanser.de/>
- <http://nvlpubs.nist.gov/>
- <http://onlinelibrary.wiley.com/>
- <http://aem.asm.org/>