



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3162613

Semester – VI

Subject Name: Weathering of Rubber

Type of course: Open Elective – II

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	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	The Environment: Introduction, sunlight, temperature, Moisture, Pollutants	07
2	Rubber Product failure due to Weather: General introduction, Ionizing Radiation, Humidity, Fluids(gases, liquids, vapors), Bio organism, Mechanical Stress, Electrical Stress.	08
3	Degradation Mechanism: Introduction, Thermo-oxidative degradation, Thermal decomposition, Radiation degradation, Ultraviolet light degradation, Ozone degradation,	08
4	Time Dependent Limitations: Induction period, Oxygen diffusion, Fluid transport.	07
5	Artificial Weathering: Introduction, Artificial Light Sources, Ultraviolet Radiation output of Artificial Sources, application of Weathering Devices: Correlation with Natural Exposure, Acceleration Factors.	08
6	Effects of Weather on Rubbers: Introduction, Unsaturated Rubbers: structure, Ozone Degradation, Natural Rubber, Chloroprene Rubber, Butadiene Rubber , Styrene- Butadiene Rubber, Saturated Rubbers, Specialty Rubbers, Fluorocarbon Rubbers, Silicone Rubbers, Hydrin Rubbers, Acrylate Rubbers, Miscellaneous Rubber Compounds, Thermoplastic Polyester, Oven Ageing Trials etc.	08
7	Effects of Weathering on Rubber Product Properties : General. Hardness. Modulus. Tensile Strength. Elongation at Break, Resilience, Low Temperature Stiffness, Volume Change, Resistivity, Compression Set, Effect of Temperature. Effect of Ozone. Conclusions.	08



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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:-

- Ageing of Rubber By: R.P. Brown, T. Butler and S.W. Hawley
- Natural Ageing of Rubber By: R.P. Brown and T. Butler
- Rubber Product Failure By : Roger P. Brown
- Weathering of Polymers by Anthony Davis & David Sims

Course Outcome:

After learning this course students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Analyze the effect of environmental factors on rubber products	15
CO-2	Compare the different mechanism for degradation	10
CO-3	Identify and Solve different failure in rubber products due to weather	15
CO-4	Explain different sources of artificial weathering.	15
CO-5	Evaluate the relationship between effect of weather & rubber products properties	15



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List of Open Source Software/learning website:

- <http://www.chicagorubbergroup.org/>
- <http://facts-inc.com/>
- <http://www.polydynamics.com/>
- <http://www.smithassoc.com/>
- <https://www.dowcorning.com.cn>
- <http://www.allsealsinc.com/>