GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code:3172618
Semester – VII
Subject Name: Cleaner Production in Rubber Industries

Type of course: Open Elective -III

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1.	**Introduction:** Introduction to Cleaner Technology (CT), Technology adoption for Cleaner Production (CP), concept of CP, Role of C.P. in survival and sustainable development.	06
2.	**Cleaner Production methodology:** The basic necessity and potentials for rubber industries, C.P. tools, techniques, methodology and applications.	06
3.	**Cleaner Technology:** Cleaner Technology (CT) Criteria for Rubber Industry with case study, CT Criteria for Latex and Block Rubber Industry, Green Technology.	06
4.	**CT Options for Rubber Industry:** CT options for Latex and Block Rubber Industry, Production Process for Latex and Block Rubber, Cost Calculation of Economic Benefits due to Reduced Loss of Rubber Content.	06
5.	**33R Concept:** Overview of Good Housekeeping, Process Modification/Changes, Process Technology Innovations, Equipment Modification, Reduce, Reuse and Recycle, waste disposal measures.	05
6.	**Quality Control:** General considerations, sampling inspection, patrol inspection & Validation, subjective inspection etc. New methods like Six sigma.	05
7.	**Process Intensification:** Concept and advantages of Process Intensification, case studies based on Process Intensification in rubber and latex processing, Environmental Issues of Natural Rubber Processing sector with case study of CP.	05
8.	**Environmental considerations:** A study on environmental concerns and corporate social responsibility in Indian tyre industry: Tyre industry profile, Indian standards, environment concerns, CP, Recycling of	06

	Tyres, CSR activities in different tyre companies of the industries, findings and recommendations, etc .	

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	15	15	10	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:

- Rubber products manufacturing technology by Anil, K.B., Malcolm, M.H., H.A., Benarey, et al. (1994) Marcel Dekker, Inc.
- Environmental Impact Assessment report for Xuan Lap latex rubber processing company; Dong Nai p rovince, Vietnam Applied Technique and Production Company (2004).
- Cleaner Production Worldwide, 1993, United Nations Environment Programme, Industry and Environment, Paris, France, 1993
- Cleaner Production: Training Resource Package, UNEP IE, Paris, 1996
- Industrial Sector of Practice for Pollution Prevention (Cleaner Technology)

Course Outcomes:

After learning this course students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Define the concept of cleaner production and its requirement for Sustainable development.	15
CO-2	Explain the various cleaner production Tools and methodologies.	15
CO-3	Analyze the different types of cleaner production options and carry out case studies.	15
CO-4	Justify the 3R concept and its impact on environmental issues related to rubber industries.	15
CO-5	Improve the design and processing for various rubber products manufacturing by applying process Intensification.	10

List of Open Source Software/learning website:

- https://www.sustainablesanantonio.com/practices-technology/reduce-reuse-recycle/
- https://www.iloencyclopaedia.org/contents/part-xii-57503/rubber-industry
- https://www.scientific.net/AMR.1133.221
- https://www.list-technology.com/processes/process-intensification/