GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Under Graduate

Branch: Rubber Technology

Subject Code : BE05026091

Subject Name: Rubber Product & Process Engineering

w. e. f. Academic Year:	2024-25
Semester:	5
Category of the Course:	Professional Core Course

Prerequisite:	None
Rationale:	This course provides fundamental knowledge of industrial safety, sanitation, pollution control, plant layout, cost estimation, maintenance, and waste management in rubber industries. It helps students understand hazard identification, safe handling of rubber chemicals, environmental protection measures, and regulatory compliance. The inclusion of motion and time study, JIT concepts, cost analysis, and maintenance strategies develops managerial and operational decision-making skills. Overall, the course prepares students for efficient plant management, sustainable production practices, and economically viable operations in the rubber industry.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	Marks % weightage
C01	Explain the importance of Industrial Sanitation & Housekeeping	15
C02	Select the different safety equipment according to Industry requirement	20
C03	Solve the problems related to industrial pollution and waste management	20
C04	Design the plant layout for rubbery industry	15
C05	Calculate the cost analysis' of rubber product	20

Teaching and Examination Scheme

Teaching/Learning Scheme in hrs/semester					Total Credits	Assessment Pattern and Marks					Total Marks
						Theory		Practical			
L	T	P	PBL*	TH	TH/30	ESE (E)	PA (M)	PA (I)	PBL(I)	ESE (V)	
45	0	30	15	90	3	70	30	20	30	50	200

Where L = Lecture, T= Tutorial, P= Practical, TW/SL = Term-Work / Self-Learning, TH = Total Hours, ESE = End-Semester Examination, PA = Progressive Assessment

*** Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.**

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Industrial Sanitation & Housekeeping:	04	10
2.	Industrial Safety: General introduction, Safety science, Technology of hazard identification, Nature of fire & explosion & their Remedies, Safety in use of Rubber machineries & Equipment. Toxic hazards of Rubber Chemicals & their handling. Safety audits, fire protection systems, effluent testing, and workplace sanitation shall be studied in reference to relevant BIS standards such as IS 14489, IS 2190, IS 3025, and IS/ISO 45001.	05	10
3.	Industrial Pollution: Various types of Environmental pollution by Rubber Industries, Their impact & remedial measures	05	10
4.	Location & Layout: Factory location & layout, Plant location & layout, Equipment layout Guiding principles for layout of rubber industry. Calculation of storage area	05	15
5.	Motion & Time Study: Establishing time value of time study, processing & use of time study date. Aims and benefits of time and motion study	05	15
6.	Cost Estimation & Profitability Analysis: Costing, Fixed, Variable & overhead costs, Job costing & Process costing, Product Cost, Cost analysis. Investment, Profitability analysis Projected cash flow statements and balance sheets. Introduction to project identification & Formulation for Rubber products.	05	10
7.	Plant Maintenance: Types of Plant maintenance: Unplanned and planned maintenance, Preventive maintenance and its importance.	05	10
8.	Just In Time Concept: Concept of JIT, Right first time and Total quality management.	05	10
9.	Waste Management: Different ways of Waste disposal in rubber industry	06	10
	Total	45	**100**

Suggested Specification Table with Marks (Theory):

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

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Rubber Processing & Production Organization. By: Philip K. Freakley

2. Rubber Products Manufacturing Technology By: Anil K. Bhowmick

(b) List of Open Source Software/learning website:

- http://esatjournals.net/
- http://www.tropical-rainforest-animals.com/Environmental-Pollution.html
- http://www.chemionics.com/natlatex.html
- http://safety-work.org/

Suggested Course Practical List: If any

Practical based on above topics.

Overall SDG Mapping:

The course primarily supports **SDG 3** through industrial safety and sanitation practices, **SDG 8** and **SDG 9** through efficient plant management and economic productivity, and **SDG 12** through waste management and pollution control measures. It also contributes to **SDG 13** and **SDG 6** by promoting environmentally responsible industrial operations in the rubber sector.

Activities suggested under problem based learning:

Sr No.	Name of the activity	No. of hours	Evaluation Criteria
1.	Online Course	Minimum duration of the course should be 20 h.	Based on assignment submitted and certificate produced.
2.	Virtual /Industry Trip	Duration of hours-5h Report preparation- 5h Total -10 h	Based on report submitted. Report should contain manufacturing process, flow chart.
3.	Assignments	Completion of five independent tasks, each designed for a 3-hour engagement. Total = 15h	Based on assignment submitted.
4.	Case Study Analysis related to subject	Duration of data collection -6 h Report preparation – 4h Total- 10 h	Based on Problem identification, depth of analysis, technical insight, application relevance
5.	Technical Article/Video Reviews related to subject	Duration of Review -6h Report preparation -4h Total-10h	Relevance of content, clarity of summary, insights drawn, conceptual understanding

6.	DIY Experiments	5 hours including report preparation	Based on report submitted. Report should contain experiments performed which have Creativity, relevance to rubber properties, observation documentation, safety awareness.
7.	Course Seminar	Duration -10h	Based on technical Content & Understanding, Analysis, literature review, Quality of report and presentation.
8.	Mini/ Micro Project	Duration -10h	Based on Technical Analysis, literature review, methodology, innovation/sustainability aspect, Quality of report and presentation.
9.	Complex Problem solving	Duration -5h	Evaluation is based on problem complexity & clarity, analytical approach, design/experimental methodology, use of modern tools, sustainability considerations, innovation, result validation, and feasibility of solution.
10.	Videos focusing on industrial safety topics relevant to the subject	Duration of video = 5h Report preparation = 5h Total = 10h	Based report submitted. Report should contain all safety aspects explaining its importance.
11.	Visual presentation of technical content through posters, charts, or PowerPoint slides	Duration = 10 h	Based on quality of poster/chart preparation, creativity, accuracy and effectiveness of presentation skills.

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