



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3171304

Semester – VII

Subject Name: CLEANER PRODUCTION And WASTE UTILIZATION

Type of course: Open Elective

Prerequisite: - knowledge of Manufacturing processes and waste generation

Rationale: Environmental pollution caused by industry can be reduced either by treatment or by prevention at the source. Cleaner production is the technique of reduction of elimination of source of pollution from industry. This knowledge or concept is the need of the hour for all the countries of the world.

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)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
	A. CLEANER PRODUCTION:	
1	Cleaner production concept Theory of cleaner production, Effect of CP on Industrial economy	02
2	Cleaner Methodology Six steps methodology for CP, Designation of cleaner production team, Analyze process steps, generating cleaner production opportunities, selecting cleaner production solutions, Implementation, maintaining cleaner production, Financial Analysis Cleaner Production	05
3	Applications of cleaner production in industries and case studies	04
4	Energy Audit Methodology Introduction , preliminary or walk-through energy Audit, Detailed energy audit, Case studies for energy audit	04



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	B. WASTE UTILIZATION:	
1	Recycling & Reuse: Concept and application	03
2	Recycling and reuse of liquid industrial waste in different industries.	03
3	Recycling and reuse of solid industrial waste.	03
4	Waste Heat recovery from flue gases, Waste heat Recovery boilers	02
5	Types of heat exchangers, LMTD	02

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	30	10	10	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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:

- 1) GCPC manual
- 2) Industrial Water Pollution Origins, Characteristics and Treatment
– by Nelson Nemaro

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Discuss the pathways of Cleaner Production with financial analysis.	40
CO-2	Apply methodology of Energy Audits with case studies.	20
CO-3	Suggest the recycling and reuse of liquid and solid industrial waste.	20
CO-4	Identify the pathways for Waste Heat Recovery.	20

List of Practicals:

1. Performance evaluation of different Heat Recovery Alternatives of given practical problems
2. Case Study of Cleaner Production application in Pulp and Paper Industry
3. Case Study of Cleaner Production application in Electroplating
4. Case Study of Cleaner Production application in Dairy Manufacturing