GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Environmental Engineering (13), Environmental Science & Engineering (37)
SUBJECT NAME: Cleaner Production & Waste Utilization
SUBJECT CODE: 2171304
B.E. 7TH SEMESTER

Type of course: Applied engineering

Prerequisite: -

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	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	2	0	6	70	20	10	30	0	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Content	Total Hrs	% Weightage
	A. CLEANER PRODUCTION:		
1	Cleaner production concept Theory of cleaner production, Effect of CP on Industrial economy	**02**	3.5
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	**08**	14
3	Good House Keeping What is good Housekeeping? What is needed to implement good housekeeping? Check lists for GHK	**04**	07
4	Energy Audit Methodology Introduction , preliminary or walk-through energy Audit, Detailed energy audit	**06**	11

5	Financial Analysis Cleaner Production	**02**	3.5
6	Case Studies	**08**	14
	B. WASTE UTILIZATION:		
1	Recycling & Reuse: Concept and application	**06**	11
2	Recycling and reuse of liquid industrial waste in different industries.	**06**	11
3	Recycling and reuse of solid industrial waste.	**04**	07
4	Waste Heat recovery from flue gases, Waste heat Recovery boilers	**04**	07
5	Types of heat exchangers,	**06**	11

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
15	**25**	**30**	**15**	**15**

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 Outcome:

After learning the course the students should be able to:

1. Apply C.P. tools for Cleaner production.
2. Apply C.P. methodology.
3. Develop heat recovery system for industries.
4. Design different types of heat exchangers for waste heat recovery.

List of Tutorials :

1. Assignment based on concept of cleaner production
2. Assignment based on CP methodology.

3. Assignment on Energy audit of industries.
4. Assignment on Good Housekeeping concept.
5. Case studies regarding success stories in Cleaner Production.
6. Case studies on waste utilization from specific industries.
7. Assignment on waste heat recovery from flue gases

Design based Problems (DP)/Open Ended Problem:

Term paper on Industries highlighting the application of cleaner production and waste utilization in different manufacturing processes of the industry.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.