GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3723023
Semester – II
Subject Name: Cleaner Production

Type of course: Chemical Engineering

Prerequisite: Basics of Chemical Engineering & Environmental Science

Rationale: One of the major causes of pollution is industrial production, which is increasing day by day and hence cleaner production techniques have become necessary. The aim of this course is to introduce students about 'Cleaner Production Techniques' and its application leading to minimize pollution. Students will acquire knowledge about environmental, economic and technological aspects of Cleaner Production Methods. The student will be exposed to methodology of cleaner production projects, methods of their implementing into industrial establishment and process of pollution prevention and reduction along with operating costs reduction and increase in safety of operation with the help of various case studies. Thus this course deals with an emerging area and hence important for engineers.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to Cleaner production (CP):** Concept & Theory of cleaner production, Applications to industries, Benefits of CP, Internal and external motivators and drivers of CP, Barriers for CP	6
2	**CP Tools:** Source Reduction, Good house keeping, Process Technology Innovations, Equipment Modification, Reuse and recycle, Product modification, Life Cycle Assessment and its elements, CP Tools for different sectors: Food industries, Chemical sector, Electroplating and dairy sector	12
3	**Cleaner Production 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, CP and Environmental Management System viz different ISO used under CP	12
4	**Energy Audit Methodology:** Introduction , primary energy Audit, Detailed energy audit, Energy conservation, Energy conservation via Cleaner Technology	7
5	**CP and Sustainable Development:** Cleaner Production & Cleaner Technology: As a remedial measure for mitigating Climate change, Ozone layer depletion, Current practices in Cleaner Production & Cleaner Technology viz Rio Declaration and agenda 21 etc, CP network.	9
6	Case studies for various industries and financial analysis.	8

Reference Books:

1. "Cleaner Production: Environmental and Economic Perspectives", Misra Krishna B, ISBN: 978-3-642-79940-2, Springer Publication.
2. "Environmental Management Systems and Cleaner Production, Dr. Ruth Hilary, ISBN: 978-0-471-96662-3, Wiley Publication.
3. Cleaner Production : Greening of Industries for Sustainable Development, Rajiv K Sinha and Sunil Herat, ISBN -10:8171324010.
4. "Cleaner Production & Energy Conservation for Sustainable Development", Jurgis Staniskis, Lithuania C. Jayaraman, ISBN: 9789351301936, Daya Publishing House.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Ability to explain the concept and principles of cleaner production	10
CO-2	Ability to suggest different unit operations in industrial production process to minimize pollutions.	15
CO-3	Ability to describe cleaner production measures applicable to different industries	20
CO-4	Ability to conduct energy and material balances for processes as part of a cleaner production assessment	30
CO-5	Ability to evaluate environmental management strategies and its relation to the concept of sustainable development	10
CO-6	Ability to suggest cleaner production methods for a given situation which will also lead to cost reduction in long run.	15

List of Experiments:

1. Application of Cleaner production in different industrial sector.
2. Use of Heat Exchangers as cleaner production devices.
3. Energy Audit for Campus.
4. CP application in campus.

List of Open Source Software/learning website:

1. www.scew.gov.au/.../anzecc-ppr-towards-sustainability-achieving-cleane
2. www.unep.org/Pdf/Capacity_building.pdf
3. www.iisd.ca/consume/unep.html
4. www.gcpc.org.in

In the beginning of the session, subject faculty will allot an OEP / DP to the students. Students will be free to choose a topic of their choice which will be relevant to the syllabus and they will either prepare a working model/ report / presentation / poster on their topic.