GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL SCIENCE AND TECHNOLOGY (35)
ENVIRONMENTAL MANAGEMENT-I
SUBJECT CODE: 2153508
B.E. 5thSEMESTER

Type of course: Environmental Science & Technology

Prerequisite: A good fundamental backup of Pollution prevention practices.

Rationale: This subject is intended to make students aware about Environment Management system and quality control. It also makes them learn about various management tools and estimation techniques.

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)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Topic	Teaching Hours	Module Weighted (%)
1.	Environmental Audit(Liabilities Audits, Management Audits, Activities Audits), Energy Audit (Primary and Detail Energy Audit) Environmental Management System & Quality control: EMS Introduction, Core Element, Benefits, Documentation for EMS. Introduction of ISO 14000. Implementation of EMS Conforming to ISO 14001. OHSAS 18001 and its comparison with ISO 14001.	10	25
2	Land use pattern, Water reuse, recycle and reduce techniques, Air cleaning techniques. Bioremediation. Zero liquid discharge system, RO System, MEE and other equipments & its Economic evaluation.	10	25
3	Water resource management: Hydrological cycle, Hydrological budget, - Precipitation, Types and Forms, Origin of groundwater, Surface water sources, Water Economy (Water audit, Estimation of yield). Techno Economics of Natural Resources: Air, Water, Land and Mineral etc.	10	25
4	Planning of environmental prospects: the project pre inception and post inception inclusive of techno economic evaluation of pollution control practices. REACh and similar procedures adapted to standardize and protect the environment connected with foreign trade.	10	25

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**20**	**20**	**20**	**20**	**-**

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.

Course Outcome: After learning this course the students would have:

1) Proper understanding of environmental audit, energy audit and EMS
2) Knowledge about land use pattern, air cleaning technique, bioremediation, ZLD and MEE.
3) Proper understanding of water resource management and water economy
4) Knowledge of planning of environmental prospects along with techno-economical aspects.

Reference Books:

1) Environmental audits: evaluating and responding to environmental concerns, L Leo Motiuk Practising Law Insitute, 1991.
2) Environmental Management, Agarwal, APH Publishing, 2005
3) Complete Guide To ISO 14000 by Richard B. Clement, Simon & Schuster, 1st Ed.,,1996
4) Advances in Applied Bioremediation, Singh Ajay, Kuhad Ramesh C., Ward, Owen P. (Eds.), Springer Publishing House ,Vol 17, 2009.
5) Bioremediation: Principles and Applications**,** Ronald L. Crawford, Don L. Craw for, Cambridge University Press, 08-Sep-2005.
6) Patra.K.C, Hydrology and Water Resources Engineering, Narosa Publications, 2008, 2 nd Edition, New Delhi.
7) Mollinga .P. etal " Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2006.

List of Practicals	
1	Practice sessions of Environmental Audit (Partial Field Work) (It is a Group Activity where student can frame an Audit Team and perform audit. The team consists of 5 to 20 students.)
2	Practice sessions of Primary Energy Audit. (It is a Group Activity where student can frame an Audit Team and perform audit. The team consists of 5 to 20 students.)
3	Practice session on ISO 14000, and 14001 certification process
4	Case study on Bioremediation.(Group /Individual depend on convenience)
5	Open ended practice session on Techno Economic Evaluation of pollution.
6	Practice session on Water audit.

Design based Problems (DP)/Open Ended Problem:

1. Total Carbon credit estimation and evaluation of economic impact on society
2. Baseline data collection of any polluting stream and its economical estimation of remedial measures.
3. Preliminary impact assessment of new project inception and its economic impact on surrounding area.
4. Hands on economic viability of EMS for particular Industry along with payback period.
5. Case study of land use pattern and its economic benefits.
6. LCA of any food/Dairy product and its economical pattern.
7. Any CMD project of small scale industry.

Major Equipment: Air Audit assembly, Water audit Assembly, Lux Meter.

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.