GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering
Level: UG
Branch: ALL Branches
Subject Code: BE04000101
Subject Name: Environmental Science, Sustainability and Renewable Energy

w. e. f. Academic Year:	2024-25
Semester:	4
Category of the Course:	Core Course

Prerequisite:	Interest in natural systems sustaining life on the earth.
Rationale:	This course aims to build environmental awareness and promote sustainable thinking among engineering students. It covers core environmental issues such as pollution, waste management, and climate change, while linking them to global challenges ,need of renewable energy and sustainable development goals (SDGs). Students learn the scientific basis of environmental degradation and the role of engineering solutions in addressing them.

Course Outcomes:

Sr. No.	CO statement	Marks% weightage
CO-1	Highlight the importance of environmental sciences.	5%
CO-2	Identify the types of pollution in society along with their sources, causes, effects and mitigation	20%
CO-3	Explain the generation, impacts, and management of various types of wastes and describe the causes and effects of acid rain and ozone layer depletion.	15%
CO-4	Describe the concepts of sustainability, climate change phenomena and green building principles.	30%
CO-5	Recognize the role of Renewable Energy in sustainable development.	30%

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	PBL*	Total no of hours per semester		ESE (E)	PA / CA (M)	PA/ CA (I)	TW/SL (I)	ESE (V)	
30	30	0	0	60	2	70	30	20	0	0	120

Content:

Sr. No.	Content	Total Hrs
1	**INTRODUCTION TO ENVIRONMENT** ● Definition, principles and scope of Environmental Science. Impacts of technology on Environment, Environmental Degradation, Importance of environmental awareness and its conservation across different engineering disciplines.	02

2	**ENVIRONMENTAL POLLUTION** ● Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution, Classification of water pollutants, Effects of water pollutants ● Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO_2, NO_X, Auto exhaust, Effects of common air pollutants ● Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects ● Land Pollution: Sources, causes, effects, control & Prevention ● Solid Waste: Generation and management ● Bio-medical Waste: Generation and management ● E-waste: Generation and management ● Acid Rain, Depletion of Ozone layer and its mitigation.	10
3	**SUSTAINABILITY:** ● Definition, scope of sustainability, ● Sustainable development & Circular economy, Sustainable Development goals, ● Climate change: Global Warming and Green House Effect: concept and mechanism ● Climate Change Effects and Mitigation Strategies ● Green Building: Concept, Objectives, Core Principles & Benefits. ● Concept of 4R's: Principles, Practical Application of 4R's.	09
4	**RENEWABLE ENERGY:** ● Conventional Vs Renewable Energy, Need of renewable energy ● Advantages, limitations and principles of generation of solar energy, wind energy, hydropower, biomass energy, geothermal energy, tidal energy ● Green Hydrogen: Concept, production, storage, transportation and application	09
	TOTAL	**100%**

Suggested Specification table with Marks (Theory): (For B.E. only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	**40**	**20**	**00**	**00**	**00**

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.

Reference Books:

1. Basics of Environmental Studies by Prof Dr N S Varandani ,2013 Publisher: LAP - LambertAcademic Publishing , Germany
2. Environmental Studies by Anindita Basak ,2009 Publisher: Drling Kindersley(India)Pvt. LtdPearson
3. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
4. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley &Sons.
5. Environmental Studies by R. Rajagopalan, Oxford University Press
6. Environmental Studies by Benny Joseph, TMH publishers
7. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria & SonsNew Delhi
8. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill
9. Marco Alvera : The Hydrogen Revolution: a blueprint for the future of clean energy
10. The Energy and Resources Institute (TERI). (2022). *Hydrogen: India's Green Fuel of the Future*. New Delhi: TERI.

List of Tutorials : Based on

1. Introduction to Environment
2. Water Pollution
3. Air Pollution
4. Noise Pollution
5. Solid Waste
6. Bio-medical Waste
7. E-waste
8. Global Environmental Issue
9. Concept of Sustainability
10. Renewable Energy

List of Open Source Software/learning website : MOEF, NPTEL

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