GUJARAT TECHNOLOGICAL UNIVERSITY

Minor Degree – Energy
Subject Code: N114AP01
Semester – IV (w.e.f. AY 2024-25)
Subject Name: Energy Resources, Economics and Environment

Prerequisite: Nil

Rationale: This course is designed to equip students with the tools necessary for economic analysis and quantification of impacts of energy systems. Tools and techniques for project economics for an individual/ company perspective and macro-decision making for society, basic concepts of welfare economics and environmental economics that are necessary for energy systems analysis and their environmental impacts are covered.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs
1	Overview of World Energy Scenario, Dis-aggregation by end-use, by supply, Fossil Fuel Reserves - Estimates, Duration Overview of India's Energy Scenario - Dis-aggregation by end-use, by supply, reserves Country Energy Balance Construction - Examples Trends in energy use patterns, energy and development linkage, Classification of Energy, Sectorial energy consumption (Domestic Industrial and Other Sectors), Energy needs of growing economy, Energy pricing, Energy security, Estimation of energy use in a building	12
2	Energy Economics - Simple Payback Period, Time Value of Money, IRR, NPV, Life Cycle Costing, Cost of Saved Energy , Cost of Energy generated, Examples from energy generation and conservation, Energy Chain, Primary energy analysis Life Cycle Assessment, Net Energy Analysis Environmental Impacts of energy use Time value of money, Life cycle costing, Equivalent uniform annual cost (EUAC), Discounting factor, Capital recovery, Depreciation taxes and tax credit, Impact of fuel inflation on life cycle cost, Initial and Annual Costs, Present Worth Calculation, Repayment of Loan in Equal Annual Instalments, Annual Saving, Cumulative Saving and Life Cycle Savings	20
3	Air Pollution - SOx, NOx, CO, particulates Solid and Water Pollution, Formation of pollutants, measurement and controls; sources of emissions, effect of operating and design parameters on emission, control methods, Exhaust emission test, procedures, standards and legislation; environmental audits; Emission factors and inventories, Global Warming, CO_2 Emissions, Impacts, Mitigation Sustainability, Externalities, Future Energy Systems, stoichiometry in combustion, energy conservation principles to calculate adiabatic flame temperature during combustion of fuels	13

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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**50**	**0**	**0**	**0**

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.

Reference Books:

1. Energy and the Challenge of Sustainability, World energy assessment, UNDP, New York, 2000.
2. Energy after Rio, Prospects and challenges, AKN Reddy, RH Williams, TB Johansson, UNDP, United Nations Publications, New York, 1997.
3. Global energy perspectives / edited by Nebojsa Nakicenovic, Arnulf Grubler and Alan McDonald Cambridge University Press, 1998
4. Fowler, J. M., Energy and the environment, 2nd Ed. ,McGraw Hill, New York, 1984

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	To summarize energy scenario, energy reserves, energy consumption patterns and energy need for growing economy.	12
CO-2	To infer the sector wise energy needs, estimation of energy use in buildings and energy security aspects.	12
CO-3	To apply concepts of energy generation cost, net present worth in financial management, energy economics, and environmental impacts.	20
CO-4	To apply life cycle assessment methods, life cycle costing, capital recovery methods, depreciation tax and tax credits.	20
CO-5	To summarize pollution, global warming environmental audits, exhaust emissions impacts and mitigation.	20

Open Source Software/learning website: https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-hs03/