GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Bachelor of Vocation (B.Voc.), 1st Semester
Branch: Solar & Renewable Energy
Subject Name: Introduction to Renewable Energy Sources
Subject Code: 1110704

Type of course: Core

Rationale: Address global energy and environmental challenges, develop a strong understanding of renewable energy technologies, analyze the economic and environmental aspects of renewable energy systems & emphasize energy conservation and efficiency in renewable energy applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical		
L	T	P	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	0	3	50	0	0	0	50

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Content	Total Hrs.	Module % Weightage
1	**Introduction to Renewable Energy** Definition and significance of renewable energy, Overview of global energy consumption and its environmental impacts, Renewable energy in the context of sustainable development	4	10
2	**Solar Energy** Solar radiation and its measurement, Solar photovoltaic (PV) systems, Solar thermal systems, Solar energy applications and case studies	10	20
3	**Wind Energy** Wind as a renewable energy source, Wind turbine technology and components, Wind energy conversion systems, Wind energy applications and case studies	10	20
4	**Hydroelectric Energy** Hydropower generation and its history, Types of hydropower systems, Components of a hydropower plant, Small-scale hydroelectric systems and their applications	4	10
5	**Biomass and Geothermal Energy** Introduction to biomass and geothermal energy as renewable sources, Types of biomass feedstock and geothermal resources Environmental and sustainability aspects.	4	10
6	**Emerging Trends and Future Prospects** Emerging renewable energy technologies (tidal, wave, solar	10	20

	thermal, etc.), Innovations and research in the renewable energy sector, Global renewable energy trends and future projections		
	Total	**42**	**100**

Reference Books:

1. "Renewable Energy: Resources, Opportunities, and Challenges" by B.K. Hodge, Publication: PHI Learning Pvt. Ltd
2. "Renewable Energy Engineering and Technology: Principles and Practice" by V.V.N. Kishore Publication: McGraw Hill Education

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	10	10	-	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Createand above Levels (Revised Bloom's Taxonomy)

Course Outcomes:

Sr. No.	**CO Statement**	**Marks % Weightage**
CO-1	Understand the significance of renewable energy sources in addressing global energy and environmental challenges.	25
CO-2	Identify and describe different types of renewable energy technologies, including their working principles and applications.	25
CO-3	Analyze the economic, social, and environmental aspects of renewable energy systems and evaluate their suitability for specific contexts.	25
CO-4	Apply basic concepts of energy conservation and efficiency in the design and operation of renewable energy systems.	25

List of Open Source Software/learning website:

Students must refer to following sites to enhance their learning ability.

1. Open Energy Modelling Initiative (https://www.openmod-initiative.org/)
2. PVLIB-Python (https://pvlib-python.readthedocs.io/)
3. National Renewable Energy Laboratory (NREL) OpenEI (https://openei.org/)
4. National Programme on Technology Enhanced Learning: https://nptel.ac.in/courses