



GUJARAT TECHNOLOGICAL UNIVERSITY
Syllabus for Bachelor of Vocation (B.Voc), 5th Semester
Branch: Solar & Renewable Energy
Subject Name: Decentralise Power Generation
Subject Code: 1150701

Type of course: Core

Prerequisite: Introduction to Renewable Energy Sources

Rationale: The course on Decentralized Power Generation equips students with the knowledge to design and implement solar and wind power systems, addressing the increasing demand for sustainable energy solutions. It prepares them to handle technical, economic, and environmental challenges, contributing to the growth of the renewable energy sector.

Teaching and Examination Scheme:

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

Sr. No.	Topic	No. of Hours	Module Weightage
01	Introduction : Structure of power system, Conventional Sources of electric energy, Renewable Energy Source, Energy Storage, Growth of power system in India, Deregulation, Distributed and Dispersed Generation.	6	15%
02	Centralized and decentralized Power Generation : Decentralized vs. Centralized Power Systems, Advantages of Decentralized Power, Challenges of Decentralized Power- Technical issues: Reliability, maintenance, and quality control, Financial and regulatory barriers, Integration challenges with existing centralized grids, Historical Development and Future Trends.	12	25%
03	Decentralized Energy Sources and Technologies: Solar PV Systems, Wind Energy Systems, Biomass and Biogas Systems, Mini-Hydro Power Systems, Waste-to-Energy Systems, Case Studies on Decentralized Energy.	10	25%
04	System Design and Integration: Components of Decentralized Systems, Micro grids and Off-Grid Systems, Grid synchronization challenges: Frequency, voltage control, and stability, Environmental Impact Assessment.	8	20%
05	Integration of Solar and Wind Power in Decentralized Systems: Hybrid Solar-Wind Power Systems - Overview of hybrid systems: Combining solar PV and wind energy to improve reliability and availability, Sizing and optimizing hybrid systems based on resource availability and load demand, Examples of hybrid systems: Solar-Wind-Battery systems, Energy Storage in Hybrid Systems.	6	15%
	Total	42	100



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Distribution of marks weightage for cognitive level:

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	-	-	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create 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. Modern Power System Analysis, D. P. Kothari, I. J. Nagrath, Tata McGraw-Hill Education,
2. Solar Photovoltaic Technology and Systems: A Manual for Technicians, Trainers and Engineers, Chetan Singh Solanki, Publisher: PHI Learning, Edition: 2013, ISBN: 9788120347113
3. Wind Energy Explained: Theory, Design and Application, Authors: James F. Manwell, Jon G. McGowan, Anthony L. Rogers, Publisher: John Wiley & Sons
4. Renewable Energy Resources, Authors: John Twidell, Tony Weir, Publisher: Routledge, Edition: 3rd Edition, 2015
5. Renewable Energy Resources, Authors: John Twidell, Tony Weir, Publisher: Routledge, Edition: 3rd Edition, 2015

Course Outcome:

Sr. No.	CO statement	Marks% weightage
CO1	Understand the differences between centralized and decentralized power systems and their importance in renewable energy.	20
CO2	Analyze the principles and components of solar PV and wind systems for decentralized power generation.	25
CO3	Evaluate the challenges in integrating decentralized solar and wind systems into the grid.	30
CO4	Design and assess hybrid solar-wind power systems, considering environmental impacts and energy storage.	25