



GUJARAT TECHNOLOGICAL UNIVERSITY
Syllabus for Bachelor of Vocation (B.Voc), 6th Semester
Branch: Solar and Renewable Energy
Subject Name: Testing and commissioning of solar and wind power plant
Subject Code: 1160703

Type of course: Core

Prerequisite: Fundamental of Electrical Engineering, Basics of Solar PV & Wind Powerplant

Rationale: This course is designed to equip students with the practical skills needed to ensure the efficient installation, testing, commissioning, and maintenance of renewable energy systems. With the rapid growth of solar and wind energy in India, this course provides hands-on knowledge essential for maintaining safety and performance standards, preparing students for immediate employment opportunities in the renewable energy sector.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical		
				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	<p>Installation of Solar and Wind Power Plant Components: Site selection and preparation for solar and wind power plants, Inspection & Installation of key components: Solar Power Plant: PV modules, inverters, transformers, switchgear Wind Power Plant: Wind turbine components (blades, tower, and nacelle), transformers, switchgear. Foundation of Electrical Equipment at site, Alignment of Electrical Machines, Tools/Instruments necessary for installation, Technical report, Inspection, storage and handling of transformer, switchgear and motors.</p>	08	20
2.	<p>Commissioning and Testing of Solar and Wind Power Systems: Pre-commissioning tests: Solar: Visual inspection, insulation resistance, I-V curve tracing, grounding checks Wind: Rotor assembly inspection, yaw and pitch system checks, electrical system checks Commissioning procedures: Solar: Testing of individual components (inverter, transformer), performance validation Wind: Mechanical and electrical system testing, turbine startup, grid synchronization Specific tests for transformers, Induction generator, inverters, and electrical systems</p>	12	25
3	<p>Maintenance of Solar and Wind Power Plants: Functions of the Maintenance Department; Reasons of failure of electrical equipment, Preventive maintenance: need, classification, advantages,</p>	12	25



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	<p>activities, Frequency of maintenance Breakdown maintenance: Concepts, advantages, activities</p> <p>Factors for preparing maintenance schedule, Maintenance schedule of transformer, Maintenance schedule - induction generator, circuit Breaker, storage Battery, inverter, Probable faults due to poor maintenance in transformer, induction motor, circuit breaker, inverter and battery, Remote monitoring and analysis of system performance (SCADA, data loggers), Performance ratio and degradation analysis of solar plant.</p>		
4	<p>Earthing and Protection Systems in Solar and Wind Power Plants: Importance of earthing in both solar and wind plants Earthing systems for: Solar: Module frames, inverters, transformers Wind: Tower earthing, nacelle, and generator earthing Surge protection devices and lightning protection systems, Measurement of earth resistance and improvement techniques.</p>	04	10
5	<p>Electrical Safety, Regulations, and Environmental Considerations: Causes of electrical accidents, Factors affecting the severity of electrical shock, Actions to be taken when a person gets attached to live part, Electrical safety regulations, Fire safety measures, Environmental impact assessments for solar and wind projects</p>	06	20
	Total	42	100

Reference Books:

1. Rao, S., "Testing, commissioning, operation and maintenance of electrical equipment", Khanna Publishers, New Delhi
2. Suneel Deambi, "From Sunlight to Electricity: A Practical Handbook on Solar Photovoltaic Applications," TERI Press.
3. Solanki, Chetan Singh. "Solar photovoltaics: fundamentals, technologies and applications." Phi learning pvt. Ltd., 2015.
4. S. P. Sukhatme and J. K. Nayak "Wind Energy: Theory and Practice" Tata 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
10	15	15	10	--	--

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



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Course Outcomes:

Sr. No.	CO Statement	Marks % Weightage
CO-1	Install key components of solar and wind power plants safely and efficiently.	20%
CO-2	Perform pre-commissioning and commissioning tests on solar and wind systems.	30%
CO-3	Develop maintenance schedules and troubleshoot issues in solar and wind systems	30%
CO-4	Apply safety regulations and protection systems in solar and wind power plants.	20%

List of Open Source Software/learning website:

<https://nptel.ac.in>.